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ABSTRACT

Central Park East Secondary School (New York) is a school committed to authentic and learner-centered education. The school has developed an approach to assessing student performance that is active, authentic, and learner-centered. Students in the school's Senior Institute, a division comparable to the traditional grades 11 and 12, prepare 14 portfolio requirements and present 7 of them orally as graduation requirements. These portfolios, along with a common core of coursework and community internships, make up the Senior Institute curriculum. Portfolio requirements include: (1) postgraduate plan; (2) autobiography; (3) school and community service and internships; (4) ethics and social issues; (5) fine arts and aesthetics; (6) mass media; (7) practical skills; (8) geography; (9) second or dual language; (10) science and technology; (11) mathematics; (12) literature; (13) history; and (14) physical challenge. A more extensive final senior project, which may be an exploration of one of the portfolio items, is also required. The school constructs an evaluative frame for development by using portfolio exhibitions and by involving staff from all school divisions in the development of standards and evaluation of the portfolios. Three figures illustrate aspects of the portfolio process, and an appendix gives a sample science portfolio. (Contains 16 references.) (SLD)

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Graduation by Portfolio at Central Park East Secondary School

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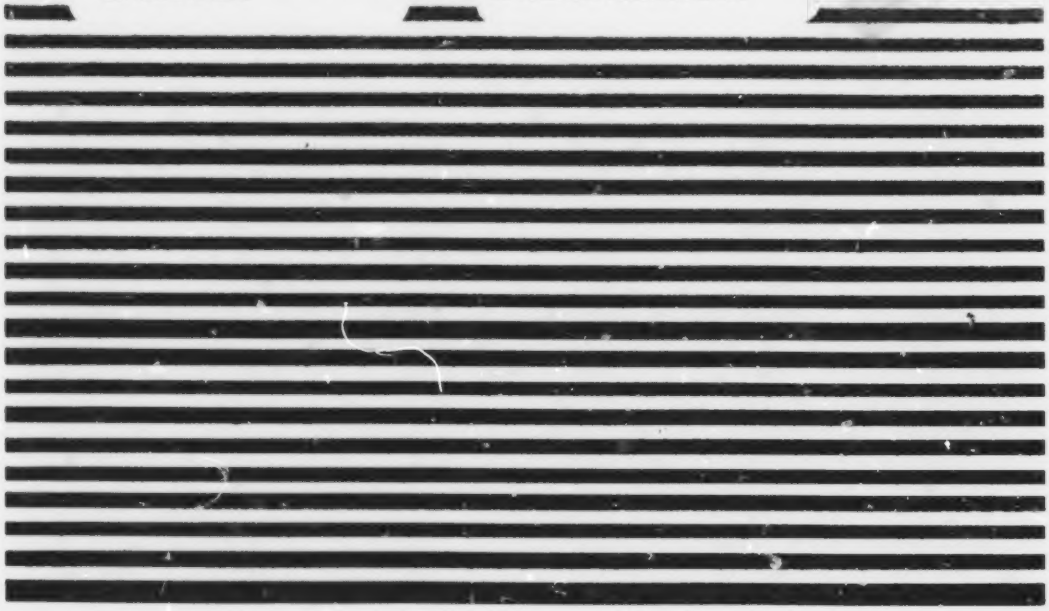

A Series on Authentic Assessment and Accountability

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Linda Darling-Hammond
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December 1994

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by Linda Darling-Hammond, Jacqueline Ancess, and Beverly Falk
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Linda Darling-Hammond
Jacqueline Ancess

Edward*[1] is midway through the presentation of his science portfolio to his graduation committee, made up of his advisor, two other faculty members, and a younger student at Central Park East Secondary School (CPESS). Behind him on the chalkboard are the names of three popular antacids: Milk of Magnesia, TUMS, and Mylanta, along with their chemical names and equations showing how they break down in the presence of acids. A tall, lanky young man with a shy smile, Edward is walking back and forth, pointing to various parts of the equations, explaining how he found in his experiment that Milk of Magnesia neutralized more acid than Mylanta or TUMS, but another group in his class found that baking soda neutralized acid more effectively than any of these three.

He stops, leaning intently over the desk before him, and queries in an urgent tone, "Now, I asked myself, 'How can this be? How can baking soda perform better than all these others, yet they are doing so much better on the market?'" This is the key moment of an authentic learning experience -- the moment when a student challenges himself with a self-initiated question that he is driven to find the answer to.

Edward goes on to explain that when he did further research, he discovered that the American Medical Association does not recommend the use of baking soda because it creates a salt that raises blood pH and therefore is sometimes harmful to your health. In the remainder of his research, he evaluated the health effects of the different salts produced by each of the other products to reach an answer to the question with which he titled his report, "How do you spell relief?"

When he finishes his presentation, the committee asks a wide range of questions about Edward's experiment, his research process, his conclusions, and other questions that could be investigated following on the heels of the ones he explored. They then explain how they have evaluated his presentation and portfolio item. The committee members illustrate the basis for their evaluations with concrete examples of criteria Edward has met in fulfilling this graduation requirement. Committee member Mardi Tuminaro, a CPESS teacher, says:

> I gave the paper an 18 [out of 20]. I thought it was a wonderful paper: It went beyond the scope of the initial experiment; it provided evidence of literature research in addition to the experiment; it was clear that you knew what you were doing in the experiment; and I loved the way it was written. . . . I gave you a four [out of five] on the presentation, because I was somewhat disappointed in your ability to explain pH, although I felt that you handled the rest of the presentation and questions quite well.

Committee member and CPESS co-director Paul Schwarz follows with his evaluation:

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[1] Students' names have been changed and are denoted by an asterisk.

I loved it. I gave it a 20 across the board. I thought the paper was clear; it was personal and yet it also acknowledged the work of the group. It went beyond the problem that you initially stated in terms of investigating side-effects. I understood what you were talking about. And on a more personal note, it brought back some old chemistry memories!

As the committee laughs about whether those old memories were likely to have been positive ones, Edward's obvious pride in his accomplishment shows in the irrepressible smile playing at the corners of his mouth. Being told by respected colleagues precisely why and how one's work is interesting, valued, and understood is a confidence-building -- and competence-building -- experience for any of us, and one most teenagers rarely encounter. It is an experience that every senior at CPESS will have several times, as each of 14 portfolio entries are carefully evaluated and seven of them are presented before the graduation committee for a roundtable discussion and assessment.

Edward was a member of the first graduating class of Central Park East Secondary School, which was founded in 1985 by Deborah Meier after she had successfully created three alternative elementary schools in the same East Harlem neighborhood. CPESS is an extraordinary secondary school that is committed to authentic and learner-centered education and has developed an approach to assessing student performance that is itself active, authentic, and learner-centered. The CPESS graduation portfolio establishes high standards without standardization, and it creates a dynamic vehicle for ongoing curriculum development, professional discourse, and meaningful dialogue among parents, students, and school staff about educational goals and values. It also allows for much deeper and more effective accountability for student growth, learning, and preparation to succeed after high school than most schools provide. The assessment system, embedded as it is in an organization structured for caring and striving for academic rigor, succeeds at motivating and deepening student learning rather than trivializing or depersonalizing students and their work.

A High School Structured for Success

From its inception, the school has been carefully designed to support students and teachers in their work together. Central Park East Secondary School is small and intimate by city standards: Its 450 students in grades 7-12 are drawn largely from the local community, and many attended one of the three alternative elementary schools out of which CPESS grew. The students and their parents can choose CPESS from among other junior high schools in District 4, but the school does not screen out students to create an elite student body. In 1991, when the research for this case study was conducted, 85 percent of the students were from Latino and African-American families, most of whom lived in the neighboring East Harlem community; 60 percent qualified for free or reduced-price lunch; and 25 percent were eligible for special education services. CPESS shares a building with two other schools, but maintains its own character and values in the midst of the overwhelming size,

density, and impersonality that tend to characterize New York City public schools.

The CPESS information booklet articulates the commitments that have guided the school since it was started in 1985:

> In 1985 we promised to be more than a place to "stick it out." Our students do stay with us -- our dropout rate is tiny. Our advisory system and small class size insure that every student is well known by staff so that they can be taught to use their minds well and so that staying in school is the expected norm. There are no cracks at CPESS for students to fall through. . . . Beyond sticking it out we promised to be a place where learning would be challenging, where students would get excited about their work in the here and now so they would be prepared to face the future with strength, skills, and confidence. . . . Finally, we made a promise that CPESS would be a caring environment -- a place where the answer to the question "Who cares?" is answered by a resounding "Everyone!" Everyone does care at CPESS and we promise that caring -- about each other and about education -- will always be our signature (CPESS, n.d.).

Visited by over 2,000 educators and others each year, the school has set a standard for urban education that works for young people: In a city with a graduation rate of only 55 percent in five years, CPESS graduates well over 90 percent of its ninth-graders within five years and does so to much more demanding standards than most schools.[2] The school also sends more than 90 percent of its graduates on to college right after graduation, with others entering college after working for a year or two. In the first three graduating classes, students have gone on to Ivy League schools like Columbia and Brown, as well as to many campuses in the State University of New York system; private colleges like Syracuse, Vassar, Wesleyan, and New York University; and historically black colleges like Spellman and Howard. As we describe later, students find that when they reach these campuses they hold their own admirably, that they have indeed learned to use their minds well and are confident in doing so.

With these extraordinary outcomes, one might conjure an image of a school that is idyllic and problem-free. Yet CPESS is not a fairy-tale school. Meier (1992) describes how the community copes with the realities of urban education -- the police finding crack vials near the front door (left by the dealers who ply their trade in front of the school); teens who must traverse hostile territory to and from school; young women who become pregnant; children who see friends and parents die from gunshots and AIDS. Co-director Paul Schwarz notes:

> We are supported. There's a synergy and a community that lifts us up. But

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[2] In the first class of ninth graders, 82 percent of those that stayed at CPESS (i.e., did not transfer or move) graduated within four years, and 97 percent graduated within five years. Statistics have been comparable in subsequent years.

> we're real, too. There is anger and there are problems. It's real and messy and noisy. We all struggle with the same issues. You struggle every day with teaching and students. We have all the issues any institution would have with 450 adolescents.

The struggles are more successful because the school is structured to create bonds of caring that withstand the stresses that can otherwise easily overwhelm students, their families, and their teachers. The small size and communal nature of CPESS are key to its ability to create strong bonds with students and parents -- the basis of genuine accountability. As Meier (1989) explained in a ***New York Times*** editorial:

> A good school can't work without greater trust and support from families. But trust comes from parents, teachers, and students knowing each other over a period of time. . . . Trust builds and issues that arise get settled handily. Accountability to parents, as well as to the community, is a less knotty problem.

The school is deliberately small, which permits such familiarity and trust. Research and experience demonstrate that smaller, more personal schools are more effective in heightening achievement, in graduating students, in creating good interpersonal relationships, and in providing leadership opportunities to students (Fowler, 1992; Gottfredson and Daiger, 1979; Green and Stevens, 1988; Haller, 1992; Howley, 1989; Howley and Huang, 1991). Most importantly, these schools are more effective in allowing students to bond with important adults in their learning community. The bonds between students and adults increase the capacity of the school to assume roles that other communities and families find harder and harder to play. CPESS has consciously created such a learning community and its assessment practices provide a crucial part of the community's core: its focus on meaningful learning.

Accountability for Meaningful Learning

A commitment to authentic teaching, learning, and assessment at CPESS are part of its approach to accountability. It shares this commitment with other members of the Coalition of Essential Schools, a network of restructuring secondary schools to which CPESS belongs. This commitment to authenticity leads to a naturally integrated approach to academic and vocational instruction and to instruction across the disciplines. Tracking has never been a part of the structure at CPESS. There is neither an academic track nor a vocational track for students. Intellectual and experiential work are part of the common core. Application of knowledge in real-world contexts that are personally and socially relevant is the proving ground for all forms of learning at the school.

Several principles that guide CPESS and the Coalition of Essential Schools undergird these practices:

- *Less is more*. It is more important to understand some things well than to know many things superficially. Schools must focus on the essential skills, areas of knowledge, and habits of mind that are central to students' becoming well educated members of society.

- *Student as worker*. Learning is not an observer sport. Students must be active participants and active citizens, discovering answers and solutions, and learning by doing rather than by simply repeating what texts or teachers say.

- *Goal setting and assessment*. High standards are set for all students. Students should be evaluated on the basis of their performance, not hours spent or credits earned. Performance assessment should be as direct and authentic as possible. Graduation should be based on demonstrated mastery over clearly stated competencies related to the school's goals.

- *Personalization*. Schools should be personalized to the greatest extent possible. Learning units should be organized so that students and adults remain together in small communities over several years so they can get to know each other well (CPESS, n.d.; Center for Collaborative Education, n.d.).

As described below, the school makes good on these commitments through its policies, its structures, and its practices, ranging from curriculum through assessment and including organizational arrangements and relationships between and among students, teachers, and parents.

The Rationale for Portfolio-Based Graduation

In 1987, three years before the first cohort of CPESS students would reach their senior year, Deborah Meier, the school director, and Haven Henderson, who would become the Senior Institute director, went to Racine, Wisconsin, to examine the system of portfolio assessment called Rites of Passage (ROPE), developed a decade earlier by an alternative public school called Walden III. They spoke to students, parents, and staff and observed the program in action, confirming their interest in adopting a similar performance-based assessment grounded in active learning experiences for students. A major attraction is that the performance-based exhibitions in the Walden model create the "real live audience for schoolwork" that Meier and Henderson sought.

The CPESS committee returned to New York and shared the ROPE system with the rest of the staff. During the next two years, the staff, along with parents, other educators, and the Coalition of Essential Schools worked to create their own assessment system and the ***Senior Institute Handbook***, which lays out the philosophy of the school and its relation to the graduation requirements:

> The fundamental aim of CPESS is to teach students to use their minds well and prepare them to live productive, socially useful, and personally satisfying lives. . . . The curriculum affirms the central importance of students learning how to learn, how to reason, and how to investigate complex issues that require collaboration, personal responsibility, and a tolerance for uncertainty. Students graduate only when they have demonstrated an appropriate level of mastery in each area (CPESS, 1991, p. 11).

Since its inception, CPESS has focused on developing an environment for learning that permits students to construct their own knowledge, develop their capacities for independent reasoning and action, and develop "habits" of mind and behavior that will enable them to be competent, responsible citizens. The portfolio system of graduation supports all of these goals, and because of its focus on creating a corpus of high-quality work, it is especially conducive to the development of sustained habits of thought and work. The projects require research and planning: They demand that students organize their time and their thoughts; commit to an in-depth process of inquiry, critique, and reflection on a variety of topics and on their own work; acknowledge and participate in standard-setting; and find their own voice in the process. As one recent graduate described the effect of the portfolio on work on her current abilities:

> It's worth all the work you do in twelfth grade. It prepares you for college. The outcome is that we're able to tell somebody what we think. We can think critically, go in-depth, and research things on our own. We can express our viewpoint and back it up.[3]

Darwin Davis, a father of one of the first graduates and chair of the parent association, concurs that the portfolio process supports the school's most ambitious goals for students:

> Portfolio is an attempt -- a successful attempt in my view -- to document the *variety* of student skills, not just math skills or just reading skills, which too often other schools focus on to the detriment of other learning skills and other learning areas.
>
> I was impressed by the assessment process. It was an extraordinary amount of work to produce those 14 portfolio items. One student explained it this way at one of the CPESS assessment conferences: "Well, let me put it to you this way. My mother just completed her Ph.D. and she had one dissertation. We had 14." And the audience instantly got it. Because it took that same kind of work, obviously not as detailed nor as long-term as a PhD dissertation, but in fact those students invested their time, their energy, their smarts, their peers,

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[3] Quotations not identified by specific documents or publications have been taken verbatim from interviews with CPESS community members.

> and their committee in producing 14 different portfolio items, which reflected their ability not only at what they'd learned but where they wanted to go in their lives.

Students' intellectual development at CPESS is guided by five Habits of Mind, which embody the goals of the school and permeate the entire curriculum. They include:

- *Weighing evidence*: How do we know what we know? What is the evidence and is it credible?

- *Awareness of varying viewpoints*: What viewpoint are we hearing, seeing, reading? Who is the author and what are her/his intentions?

- *Seeing connections and relationships*: How are things connected to each other? Where have we heard or seen this before?

- *Speculating on possibilities*: What if . . .? Can we imagine alternatives?

- *Assessing value both socially and personally*: What difference does it make? Who cares? (CPESS, 1990).

In classrooms throughout the school, the Habits of Mind are prominently displayed. These modes of inquiry guide the assessment of student work throughout CPESS and appear as criteria incorporated into assessment instruments for the required graduation portfolio. In developing its graduation requirements, CPESS staff engaged in a process of "planning backwards" (McDonald, 1993), asking three questions: "What kind of graduate do we want?" "How do we get there?" "How will we know when we have arrived?" This third question has led CPESS to develop graduation requirements -- and structures within which students prepare for these requirements and for later life -- that state what students ought to know and be able to do and that reflect the values and goals of the school.

These goals are intended to enable students to be well prepared for all aspects of life in a complex and changing world. They are neither academic nor vocational. Nor are they predetermined by what role or job students see themselves taking in the future. Although students' goals are important as entry points into their interests and motivations, they do not differentiate or limit students' curriculum options. The school's goals are to enable students to live empowered lives in which they can continue to learn whatever they need to be successful at whatever they care about -- and to be contributors in their fields of work as well as to their local communities. As the CPESS newsletter notes about the Habits of Mind:

> What we set about looking for was a set of "intellectual habits" that make us good at handling important ideas. It's these "habits of mind" that make us lifetime learners and useful citizens. What are these mental habits? It seemed

to us that well-educated people have a habit of asking certain kinds of questions. We spent a lot of time trying to come up with the ones that were most powerful. We wanted the ones that were used by a top-notch auto mechanic, computer technician, writer, doctor, or lawyer. We were looking for habits that are needed by historians as well as mathematicians. We were looking for the habits that keep citizens from being conned by "experts," and that serve us well at home as well as at work. We wanted habits that held up well in college, as well as in the streets. We invented five. We could have found many more, but we liked these best. We hope you do too (CPESS, 1991, October 7).

The Senior Institute

While the aims of the school express the kind of graduate CPESS wants, the Senior Institute exemplifies how the school hopes to get there. The Senior Institute is the division of the school that in most traditional structures would be identified as grades 11 and 12,[4] and it is consciously designed to serve as a transitional stage of increasing responsibility prior to students' entry into the "adult" world of college or work. The increasing independence afforded the students is intended to help them learn to manage their affairs while there is still a safety net.

The Foundation for the Senior Institute

A number of the school's structures support students and teachers in their work in the years prior to and throughout the Senior Institute. In Divisions I and II, students pursue a common core curriculum, featuring two hours daily in each of two team-taught interdisciplinary courses: humanities/social studies and mathematics/science, along with an hour-long Spanish course and a one-hour advisory. These courses take place within "houses," made up of four to five teachers and 75 to 80 students, which, along with the advisories, help personalize students' experiences of the school. They remain with the teachers and students in their house for two years until they "move up" to the next division.

The advisory is one of the school's key strategies for ensuring that students cannot fall through the cracks. Each professional staff member works over a period of two years with a group of 15 students and their families, providing academic and personal support. The advisory period is used as a study time, an opportunity for quiet reading, writing, discussion of health, social, and ethical issues, and for one-on-one and group advising and

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[4] Division I corresponds to grades 7 and 8; Division II corresponds to grades 9 and 10; and the Senior Institute approximates grades 11 and 12. These divisional structures, however, bring with them highly personalized advisement and teaching arrangements that allow them to serve student needs that traditional school arrangements ignore.

counseling. The advisor is the "expert" on the student, meeting frequently with the family and with other teachers to ensure communication about the student's needs and progress, to "tap the family's expertise" (CPESS, n.d.) and to guide the student through courses, exhibitions, and graduation requirements.

Students in Divisions I and II also spend two and one-half hours weekly in a community service program, tutoring younger students, working with senior citizens, and working in settings like museums and other nonprofit organizations. While these experiences help them to understand the adult world, explore occupations, and develop a sense of social responsibility and initiative, the community service time also allows their teachers to spend at least one morning per week engaged in team planning so that the school's promises about high-quality curriculum and teaching in a caring environment can be fulfilled.

Putting Students at the Helm

These opportunities prepare students for the much more demanding, self-directed work they will encounter in the Senior Institute. While there are core seminars that all students take, much of the work in the Senior Institute is structured around a process of negotiation aimed at simultaneously achieving the goals of each student and the school. Students can design their course of study within the broad guidelines of the core requirements of literature, social studies, mathematics, science, and Spanish. The school offers a variety of courses in literature, history, political science, sociology, economics, biology, physiology, chemistry, advanced geometry, algebra, trigonometry, statistics, art, and video as well as Spanish.

In addition, each student participates in a work-related internship and attends at least two courses on college campuses. Some of these are regular college courses; others are courses offered for high school students at campuses like Lang College, Columbia University's Teachers College, and others. These two curricular components place students outside the school in the "adult" arenas of work and college where they are evaluated by "real world" standards. Rather than trying to create courses or tests that would seek to predict, probably poorly, whether students are likely to succeed in college or in employment settings, the Senior Institute puts them in these situations, where they are evaluated and can test themselves directly against the actual criteria for performance such experiences call for. This is authentic teaching, learning, and assessment in its most immediate and authentic form. For example, Tamika*, currently enrolled in a college course on Greek mythology, understands from her experience what the standards in college are likely to be:

> I am reading ***The Iliad*** by Homer, and the readings are very hard. I have to go over it twice to really get the idea of what's going on. It really does help to reread a few times. Everything is hard, [for example], writing papers like college kids do. At CPESS you draft a lot, but not as much as they do. They draft and draft and draft. I'm thinking, "When I get to college, it's going to be exactly like this." And at least I'll have an advantage. I'll know what they're going to expect.

The Internship: Crossing the Divide

The Senior Institute internships, which follow on the heels of the community service experiences in the lower grades, are placements in work settings totaling 100 hours over the course of a semester. Students work in a wide range of settings: as office helpers at banks, publishing houses, and other businesses; as photographers and writers for nonprofit organizations; as elementary school teacher aides, veterinary aides, and computer programmers, to name a few. They take a concurrent seminar on related issues, such as work policies and practices, which students can explore at the work site and then discuss with their peers. Senior Institute teacher Joe Walters credits the internship with helping students begin to make the transition to young adult decision makers:

> Internships are of tremendous value. Students work in an area of more responsibility than when they do community service. They're doing something more in depth, spending more time. They are required to keep a log on their activities and make a presentation at the end. They are asked to look at the institution they are working in and their role within that institution. This experience makes school more real. It allows them to develop career ideas and to see where they might fit in. . . . For some students, high school may be the termination of their education. Others go on to college and are looking beyond college.

Either way, students are better prepared for their futures in tangible and intangible ways. Walters offers two examples: "One of my advisees is doing carpentry at CoopTech. He said from the beginning that he was not interested in going to college. He really likes it, and he's developing connections with people on the outside. He most likely will be employed in looking into how he's going to get into the union." Another of Joe's students wants to be an architect. In the course of planning for his future, this student took the initiative by checking out a program at a school Joe had recommended. By doing so, he learned that that particular school did not offer a degree in architecture, so he began to expand his search on his own, not relying on adult guidance to help him pursue his interests.

Students see their accomplishments in the internship as extending far beyond that particular experience. Steve* explains how the internship builds confidence and competence:

> With the community service program and internships and all the things that we do outside of the school, this makes us look at ourselves and say, "Wow! I worked with little kids who couldn't do such and such, and when I was finished with them, they were on their way to doing it. I did a good job in that place." Things like that show that you are good at doing other things.

Assessment in the Senior Institute

The completion of 14 Portfolio requirements, along with the coursework and internships described above, is the glue of the Senior Institute's curriculum. The portfolio

requirements are aimed at helping students accomplish authentic work in each of the areas the school values and to do so in ways that fundamentally connect to the students' own experiences, interests, values, and goals, preparing them to take charge of their own lives. The requirements describe tasks students are expected to tackle and standards they are expected to meet, both within and outside the bounds of traditional coursework. The curriculum is grounded in multiple assessment opportunities, including many encouragements for students to learn how to reflect on and evaluate their own work and experience. Because the requirements are performance-based, the criteria are open and constantly discussed, and work is viewed as in process and improving, giving students control over their ability to succeed. They learn that time, effort, self-discipline, and organization make the difference in being able to achieve their goals.

These qualities are the kinds of "generic" work-related skills frequently identified in recent discourse about the changing needs of American industry and the changing demands of the work force. The capacity to structure one's work, to find resources and use them for accomplishing complex tasks, is at the heart of these school-reform demands and at the core of CPESS's goals and curriculum. As the portfolio requirements demonstrate, defining school outcomes in terms of such qualities also blurs traditional distinctions between vocational and academic work and expands the definitions of both. CPESS graduates are preparing themselves to "do" history or science as vocations as much as they are preparing themselves to work in computers, photography, child care, or other areas traditionally thought of as vocational-technical training. All areas are approached from a performance-oriented stance -- and all are open to all students as areas for further academic and vocational exploration.

Parent Darwin Davis articulates how CPESS deliberately structures an educational experience that addresses what the broader society really wants from schools:

> What's ironic is if you ask an employer, a politician, a school professional, a student, a parent, a principal what they would expect a student to be after completing the academic process, most of the qualities that are enumerated speak to the ability to work with other people, to synthesize information, to think a problem through, to solve issues, to work collectively, maybe to benefit the environment, the community, or some other idealistic goal, very few of which are typical subjects or issues that are addressed in your normal school setting. CPESS brought those two ideals together -- where you had that well-rounded individual with an academic background.
>
> There are all kinds of people who can pass every test ever made, and they're not nice people to work with. They're iconoclastic, they're individualistic, they only do it their way, they're very narrow about their thinking. That's not the kind of individual people really want to work with: no one says I want the narrowest-thinking, smart, test-taking person I can get to be head of my department. Yet that's what traditional schools produce. CPESS has been

able to combine the best of both worlds -- that individual who can work with other people, who is a problem-solver, who is a leader in their own right but who is academically grounded as well. CPESS consciously brought that to the table in organizing the school.

Structures for Learner-Centered Practice

One other thing that CPESS consciously brought to the table in organizing the school was an acknowledgment that in order for students and faculty to be able to achieve such ambitious goals, teaching and learning time would have to be structured much differently than it is in traditional schools. Teachers, especially Senior Institute teachers, have time for their roles as advisor, mentor, tutor, coach, and assessor because CPESS allocates almost all of its staff to the classroom rather than to administrative slots or roles peripheral to the classroom (there are, for example, no counselors or specialists), thus affording more teacher-power on the same budget. In addition, it uses external learning experiences such as coursework at local colleges and required internships in lieu of some classes.

These strategies allow Senior Institute teachers to spend about half of their time advising students rather than teaching classes. They teach traditional courses about 12 hours per week, spend another five hours a week leading their 12-member advisories, and spend many more hours working on portfolio development and graduation committee meetings with their individual advisees.[5] Given that Senior Institute advisors accompany their advisees on college visits as well as supporting them through courses and internships, help them conceptualize their portfolios and locate resources, and serve as facilitator, backstop, and cheerleader, their student-focused time is a critical investment in students' later success and in the success of the portfolio process.

Another structural feature that supports student success is teachers' ability to work with students in a way that integrates content and enables them to get to know students well over time. As Edwina Branch explains of her move to CPESS from a traditional school setting:

> I was teaching physics in a traditional high school, and at the time I was enjoying the kids but I wasn't enjoying the situation. I wasn't enjoying the Regents curriculum and the pressure of having the kids pass that test. I remember thinking, "I wish I taught the kids math. If I had them for a longer period of time and if I had them for both math and science, then maybe I could make sure." Then I read about CPESS, and I read ***Horace's***

---

[5] Co-director Paul Schwarz estimates that a minimum of 36 hours per year per graduate are spent in graduation committee meetings. Since the average graduation load is six students per teacher, Senior Institute teachers spend a minimum of 216 hours in graduation committees. It is not unusual for graduation meetings to occur after official school hours, in the evening, or on weekends to accommodate other students and parents.

Compromise, and it was very validating. You should have kids for a longer period of time. It just made sense to me. When I got the opportunity to come to CPESS, I came, and it was great. But then the things I had -- the Regents exam, the textbook, the tests I could give at the end of the chapter were not enough.

Having created the conditions under which students can learn well and deeply, CPESS has been propelled to find ways to evaluate that learning in ways that are also more useful and more telling.

The Portfolio

During the two (or sometimes three) years in the Senior Institute, students complete portfolio requirements across 14 categories and present their completed portfolio to a graduation committee comprised of the student's faculty advisor, another faculty member, a third adult of the student's choosing, and another student.[6] Of the 14 portfolio items, seven are presented orally before the graduation committee, four from the core subjects (asterisked below). The remaining seven entries are evaluated independently, and the student may be asked about them during the graduation committee hearing. While the final review is based on the individual student's accomplishments, certain portfolio requirements can be based on group work. The portfolio requirements include the following:

1. ***Postgraduate Plan***: Each student must outline his or her current purpose for earning a diploma. As the ***Senior Institute Handbook*** (CPESS, 1990) notes, "Reflecting on purposes helps to set goals." Long and short-range career and life goals, financial concerns, living arrangements, and indicators of progress, such as examinations, interviews, and letters of reference, must be included in this section. The Postgraduate Plan is begun at entry to the Senior Institute and provides direction for all of the student's subsequent work in the Senior Institute. It is revised as needed and revisited for evaluation at the time of graduation.

2. ***Autobiography***: This gives the student another opportunity to reflect on his or her life and to plan for the future. A project of the student's choosing is required. It may examine family history, special events, relationships, values, or beliefs in any of a variety of media -- written or oral narrative, essay, art, video, drama, music, or other form selected by the student.

3. ***School/Community Service and Internship***: Opportunities for working and serving others are part of student experiences each year starting in seventh grade. Students must develop a formal resume of their past work and employment experiences along with a project that demonstrates what they have learned from one

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[6] This description draws substantially upon the ***Senior Institute Handbook***, supplemented by interviews and other school documents.

or more of these experiences. Projects can include essays, videos, work samples, reference letters, or other demonstrations of their accomplishments combined with evidence of what they have learned.

4. ***Ethics and Social Issues***: Students can demonstrate their capacity to see multiple perspectives, weigh and use evidence, and reason about social and moral issues in any number of ways -- by staging a debate, writing an editorial, discussing important issues raised in a novel or film, or creating another project that demonstrates these capacities.

5. ***Fine Arts and Aesthetics***: Creative expression and creative appreciation are both evaluated. Students must create a "hands-on" exhibition of performance in any of the arts and must offer evidence of knowledge or understanding in an aesthetic area by studying or critiquing a work, an artist, or a field of artistic expression.

6. ***Mass Media***: Students must show that they understand how different forms of media work and how they affect people and their thinking, including the CPESS Habits of Mind. This understanding can be demonstrated through many types of projects or activities, ranging from essays to exhibits or media presentations, and must include a relevant bibliography.

7. ***Practical Skills***: In keeping with CPESS's commitment to preparing students for all aspects of life, they must show evidence of working knowledge in a number of areas -- ranging from health and medical care to employment, citizenship, independent living, computers and technology, and legal rights -- in a variety of ways, ranging from securing a driver's license to registering to vote to demonstrating the ability to operate a computer.

8. ***Geography***: A teacher-made test and a student-designed performance assessment are used to evaluate geographical knowledge and the ability to use geographical tools such as maps and globes.

9. ***Second Language and/or Dual Language***: All students must demonstrate competence to work in a language other than English as a speaker, listener, reader, and writer.[7] In addition, all students must describe their personal experience with dual language issues and be prepared to discuss a key social or cultural issue associated with language use.

10. ***Science and Technology***:* Students must demonstrate knowledge in traditional ways -- a summary of the work they have completed in high school and passage of a teacher-made or state competency test -- as well as in

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[7] This requirement may be met through the New York State language proficiency exam or a College Board examination.

performances that demonstrate use of scientific methodology (e.g., conducting and documenting an experiment) and awareness of how science is used in the modern world (e.g., by staging a debate or conducting research on a scientific development analyzing social costs and benefits).

11. ***Mathematics***:* Students must demonstrate basic skills knowledge by passing a state competency test and a teacher-made test. In addition, they must demonstrate higher-order thinking abilities by developing a project using mathematics for political, civic, or consumer purposes (e.g., social science statistics or polling, evaluation data, architectural blueprints) and either scientific or pure mathematics (e.g., using mathematics in a scientific application and/or studying a mathematical topic or problem for its own sake).

12. ***Literature***:* Students prepare a list of texts they have read in a variety of genres to serve as the basis for discussion with the graduation committee. They also submit samples of their own essays about literary works or figures, demonstrating their capacity to reflect on and communicate effectively about literary products and ideas.

13. ***History***:* In addition to passing a state competency test or faculty-designed test in history, students must prepare an overview of the areas of history they have studied in secondary school and a timeline of major events and persons. They must also demonstrate an understanding of historical work by conducting historical research using primary and secondary sources and developing a bibliography. They apply the Habits of Mind by drawing connections between and among past and present events, weighing and using evidence, speculating on other possibilities, and evaluating how history is used or abused in current debates.

14. ***Physical Challenge***: Students demonstrate and/or document their participation and proficiency in any team or individual competitive or noncompetitive sport or activity over the past four years. The goal is to encourage the development of lifelong health habits and attitudes of independence, interdependence, personal responsibility, and sportsmanship.

A more extensive final senior project is also required in an area of particular interest to the student, which may be one of the portfolio items explored in greater depth.

There is no one way to complete these requirements, nor is there only one way to present them. Work completed to meet one requirement can be used to fulfill other requirements. Students can use work that they began in Division II, developing it further during their years in the Senior Institute. Because knowledge and skills are constructed and demonstrated in many different ways, CPESS encourages diverse modes of presentation: research papers, videos, constructions, and original theater pieces as well as individual and

group projects. As students prepare a wide array of products and presentations for their portfolios, they develop competencies in the analytic, creative, and practical domains and have opportunities to work cooperatively and communally. The portfolios become a vehicle for developing as well as assessing their abilities.

Quality, depth of understanding, and a demonstration of mastery of the particular subject area and the Habits of Mind are the major criteria for evaluating all of the portfolio items. The grid shown in Figure 1 (on page 17) shows how the Habits of Mind have been incorporated into a rubric for scoring portfolio items, with descriptors of levels of mastery ranging from "needs more work" to "exceeds our standards." Another scoring system has been developed for evaluating the oral presentations (see Figure 2 on page 18). These evaluations ultimately result in a grade of "minimally satisfactory," "satisfactory," or "distinguished" for each portfolio entry. These standards and the criteria by which work will be evaluated are available to the students, who use them to guide their efforts, beginning in the lower divisions of CPESS.

The 14 portfolio areas attempt to accommodate the tensions between breadth and depth. The number of areas provides breadth, but within each area, students complete in-depth projects. The portfolio is also intended to reflect cumulative knowledge and skill in each area -- with the expectation that much work will be interdisciplinary and thus will fall into more than one area for evaluation.

A Glimpse at a Portfolio

Marlena's* transcript (Figure 3 on pages 19 and 20) illustrates how all of these efforts came together in a challenging and personally compelling body of work during her Senior Institute years. The first page of her transcript, (parts of which are extracted below), though nontraditional in format, gives us most of the traditional information colleges would seek about her coursetaking and test scores: She took a strong mathematics and science sequence during those two years, including precalculus and Pascal 1 and 2, chemistry 1 and 2, genetics, and several science courses at Hunter College, as well as required courses in literature, social studies, and her internship. In addition, she passed all of the Regents Competency Tests required by the state of New York, along with the City University of New York (CUNY) placement tests, and secured creditable scores on the Scholastic Aptitude Test and College Board Achievement Tests.

The second page of the transcript provides a more personalized glimpse of Marlena's work, listing the titles of her 14 portfolio entries. How these intersect and express her interests and views can be seen by looking inside the portfolio, a weighty collection of papers contained in a large accordian folder. Her science and technology portfolio, "Construction of Expression Vectors with Phosphatases 1 & 2A," reports on an experiment on cancer-causing cell transformations conducted as part of her internship in the Minority Research Apprenticeship Program at Hunter College. Marlena's sophisticated treatment of the complex set of procedures she undertook and her fearless discussion of oncogenes and other

Student: _____ **Date:** _____

Advisor: _____ _____ **Title of Paper:** _____

Portfolio Item: _____

Reader: _____

Score: _____

	VIEWPOINT	CONNECTIONS	EVIDENCE	VOICE	CONVENTIONS
EXCEEDS 4	Paper demonstrates an in-depth understanding of the issues . presents position very persuasively and clearly discusses other views when appropriate.	This paper has a helpful beginning and concludes in a satisfying way. •It is organized so that all parts support the whole. •It makes effective transitions. •It makes larger connections.	Generalizations & ideas supported by specific, relevant and accurate information. The above is developed in appropriate depth and contains clear discussion of the evidence: its strength and weaknesses.	Lively interesting use of language. Awareness of audience.	Excellent appearance, correct format (including bibliography, footnotes, references, etc. where applicable), varied sentence structure, good mechanics - (spelling, punctuation, capitalization, paragraphing) appropriate broad vocabulary and word usage.
MEETS 3	Paper shows a good understanding of position taken and is focused. Discusses other positions when appropriate.	The paper has a clear beginning and ending. •It is organized that most parts support the whole. •It makes transitions. •It attempts to make larger connections.	Evidence supports main ideas with specific, accurate, relevant information consistently throughout the paper. Paper includes an attempt to discuss evidence.	Appropriate language, style and tone chosen.	Neat, legible, minimal number of mechanical and syntactical errors which do not interfere with understanding, appropriate paragraphing and transition. Correct use of vocabulary. Appropriate format.
APP- ROACHES 2	A position is implied but not clearly stated. Focus is inconsistent.	The paper has a beginning and an ending. •Connections of parts to the whole are sometimes made. •Some transitions are made.	Includes some evidence relevant in the topic but which is inconsistently applied and not well-developed throughout the paper. Many general statements and opinions without specific evidence. May contain some discussion of evidence.	Shows some awareness of reader and attempts to inform. Language, style or tone confused.	Sentence structure needs variation. Limited vocabulary and work choice uses, mechanical errors which interfere with understanding.
NEEDS MORE 1	Lacks focus, does not present a position. Lacks direction.	The text does not have either a beginning or an ending (one or both). •It is not yet able to connect the parts to the whole.	Mostly general statements. Little specific evidence relating to the topic.	Little awareness of readers. No particular language, style or tone adopted.	Sentence structure needs development, mechanics (spelling, punctuation, etc.) interfere with understanding, incorrect use of words, sloppy appearance, difficult to read, omits words and phrases.

Figure 1

Comments: _____

BEST COPY AVAILABLE

CPESS - SENIOR INSTITUTE
Graduation Committee Oral Presentation

Date: _____
Student: _____
Advisor: _____
Title of Paper: _____
Portfolio Item: _____
Committee Member: _____
Score: _____

Procedures:
1. Student gives 5 - 7 minute presentation.
2. The Committee questions student.
3. The Student leaves the room.
4. The Committee discusses and rates the oral presentation.
5. The Committee discusses grids.
6. The Student is recalled to begin next presentation.
7. The Committee gives feedback at the end of all presentations.

RATINGS		Articulation Categories: •Student gives effective, clear, convincing presentation of the subject. •Concepts are explained to indicate thorough understanding of ideas and their ramifications. •Clarity of expression and credible evidence are offered. •Student shows creativity, style and poise. •Student gives intelligent response to questions.
EXCELLENT presentation	5	Student is very convincing and addresses all categories.
GOOD presentation	4	Student presents material well and articulates all but one or two of the categories.
ACCEPTABLE presentation	3	The presentation needs to be more informed, in one or more areas, although not substantially.
APPROACHES acceptable level	2	The presentation may be improved with more attention given to the weaknesses which leave the audience unconvinced.
NEEDS more	1	The student's presentation was generally weak in most areas.
SCORE		

Comments: _____

_____

Figure 2

Figure 3

Central Park East Secondary School
1573 Madison Avenue, N.Y. N.Y. 10029
Tel: (212) 860-5933
(212) 410-5216 (counselor)
Fax: (212) 876-3494
ETS Code: 332964

Coalition of Essential Schools
Community School District 4
NYC Board of Education

Johnson	Marlena*			
Last Name	First Name	Middle	Soc Sec #	OSIS #

Street Address	Borough	State	Zip Code	
Parent/Guardian	Date of Birth	Sex		
Previous High School (if any)	Date of Enrollment at CPESS	Expected Graduation Date		

TRANSCRIPT OF COURSES

The following courses were taken in preparation for the Portfolio. Please refer to the Curriculum Bulletin for course descriptions and grading information. CPESS gives grades only on completion of a course of study, which requires demonstration of minimum competence. Courses are interdisciplinary and students demonstrate a variety of skills; grades therefore represent a range as follows:

Dist = Distinguished Work
Sat = Satisfactorily met requirements
MinSat = Minimally met requirements
Audit = Course not taken for evaluation
** = College Course (see Curriculum Bulletin for details)

Division II (9th) 1988/89

Humanities (Lit., History, Art)	Sat+
Math	Sat+
Science	Sat+
Advisory	Dist
Community Service	Dist

Division II (10th) 1989/90

Humanities (Lit., History, Art)	Dist
Math	Dist
Science	Dist
Advisory	Dist
Community Service	Dist
Spanish	Dist

Senior Inst, Fall 1990

Sci Foundations, Hunter	C**
Precal & Pascal 1	Sat
Lit: Autobiography	Sat
Internship	Sat+

Senior Inst, Spring 1991

Precal & Pascal 2	Sat+
Chemistry 1	Dist
Linquistics: 1000 Words	Sat+
Civil Rights History	Dist

Senior Inst, Fall 1991

Chemistry 2	Dist
Mass Media	Sat+
Lit: Essay	Sat+
Science Research, Hunter	Dist

Senior Inst, Spring 1992

Genetics	Dist
Rethinking Columbus	Sat
Science Research, Hunter	Dist

Standardized Tests

Regents Competency Tests

Reading	Pass
Writing	Pass
Math	Pass
Science	Pass
US History	Pass
Global Studies	Pass

Languages

Spanish	Pass

CUNY Placement Tests

Reading	Pass
Writing	Pass
Math	Pass

SAT's 7/91

Math	600
Verbal	430

Other Tests

ACH ENG	520
ACH MATH	530
ACH CHEM	550

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Signature, Principal Date

Central Park East Secondary School
1573 Madison Avenue, New York, NY 10029 **(212) 860-8936**

TRANSCRIPT OF PORTFOLIOS

Please refer to the Curriculum Bulletin for Portfolio requirements. A Portfolio is graded on the basis of all items within it as well as knowledge and skill defended before the student's Graduation Committee. Listed below is the title of the student's major work in each area as well as the cumulative grade. Individual portfolio items are available on request.

Dist = Distinguished Work **Sat = Satisfactorily met requirements**
MinSat = Minimally met requirements **** = Final Project (In depth study)**

The Portfolio

	Grade	Date (completed/ projected)
Post Graduate Plan	Sat	12/90
Autobiography	Sat	12/13/91
Practical Skills & Knowledge (Life Skills)	Dist	3/1/92
Internship Brookhaven National Lab & Hunter College, NY	Dist	1/3/91
Ethics, Social Issues, & Philosophy Controversy of Afrocentric Schools	Dist	2/28/92
Literature Influences on Malcolm X's life.	Sat+	3/92
History Events affecting the Controversy of Afrocentric Schools	Sat	2/28/92
Geography Geography of the West Indies	Sat+	6/5/92
Language other than English Spanish: English only versus Dual Language	Sat+	1/3/92
Mathematics Mathematical models- Lines & Sines	Dist	3/16/92
Science & Technology Construction of Expression vectors with Phosphatases 1 & 2A	Dist	4/92
Fine Arts & Aesthetics Opera :' Die Fledermaus & The Marriage of Figaro'	Sat	12/13/91
Mass Media Entertainment or News? Our Children's Education	Sat+	2/24/91
Physical Challenge Aerobics	MinSat	6/17/92

Review Date:

aspects of cell biology depict a young person well launched on a scientific career. In the section on materials and methods, she explains her procedures, which are accompanied by detailed lab sheets and findings:

> *Plasmid prep* is used to grow large quantities of DNA. The objective is to get the plasmid DNA into the bacterial cells, and then to test whether the cell contains the DNA. The cells with the DNA will not be affected by the antibiotic; the cells with DNA will live in the presence of antibiotics. The attachment is the procedure in doing the plasmid prep.
>
> The next procedure is to isolate the phosphatase fragments. First cut DNA with restriction enzymes. Then run *minigel* to separate by size, cut out fragment of interest and purify (*electrolute*).
>
> The next steps are important ones in getting constructs of phosphatases 1 and 2a. Prepare vector for insertion of phosphatases. Then do a *ligation* which is the joining of DNA strands, in order to have sense and anti-sense strands of mRNA. Double stranded RNA degrades, and the task is to reduce the quantity of the phosphatase proteins to see if in fact these proteins play a role in signal transduction in transforming cells.

In her internship portfolio, we learn why Marlena is so conversant with this kind of research. There Marlena describes three different internships in science that she undertook over two years at Brookhaven National Laboratory, Hunter College, and Columbia University. She also tells us that she has just been accepted to the New York Academy of Science's Research Training Program for the spring semester of her senior year. The internship portfolio includes excerpts of lab procedures along with discussions of what she learned in lectures and on site visits and reflections on its meaning for her life.

A mathematics portfolio includes mathematical models of rainfall and a whale sound wave with empirical data plotted and models developed under differing assumptions. A discussion of linear and sine functions follows, along with a discussion of the advantages and disadvantages of modeling as a means for predicting trends and patterns:

> The models are very useful in giving general information about what's the difference from start to finish. The models are also inaccurate because they don't show what's happening at every time interval. For instance, the line for rainfall doesn't show that at some point the rate of rainfall has decreased and increased during the data taking. The positive aspects of models out weight [*sic*] the negative aspects because models are used to represent and it is not always important to know every aspect of the data.

This same judicious approach is seen in Marlena's media portfolio, which includes a sophisticated, evidence-based analysis of race, gender, and class stereotyping in prime time

television, along with essays on violence in the media and First Amendment debates concerning song lyric censorship. These essays display Marlena's capacity to weigh and balance evidence and competing views in a thoughtful and reasoned fashion. She is able to see both sides of each debate without bias or rancor and to resolve them in a way that avoids oversimplification.

This capacity to understand competing points of view and to look for common ground also emerges in her practical skills portfolio on conflict resolution, describing her training as a mediator and her experiences mediating conflicts within and outside of her school. Here a theme emerges that is obvious elsewhere in her work and thinking:

> I feel that mediation has helped me in understanding the people around me. . . . I feel that Conflict Resolution helps those who are not mediators to understand others by allowing them to put themselves in the other's position and how they might react so that when the mediation is over there are two winners instead of one.

In other portfolios, Marlena traces the history of segregated education in the United States (her history portfolio) and applies it to current debates about Afrocentric schools (her entry for ethics, social issues, and philosophy); she discusses the ***Autobiography of Malcolm X*** (literature) and the geography of the British Virgin Islands, where her family is from (geography). In her second language portfolio, she discusses the "English-only" debate, concluding, on the one hand, that such a policy "goes against what this country stands for," and, on the other, that those who would restrict language use should be prepared to provide resources for immigrants to learn English. In these entries we see a young woman who understands the history and effects of discrimination on her life and that of others, but who is motivated by a humane sense of the possibilities for all people rather than by resentment or despair.

There are other indicators of her learning that deal with concerns of breadth rather than depth. The geography entry is accompanied by a geography test in which Marlena accurately identified the oceans, continents, and countries of the world. The literature entry is accompanied by an annotated bibliography of 24 works she has read, ranging from Shakespeare's ***Macbeth***, Dickens's ***A Tale of Two Cities***, and Victor Hugo's ***Les Miserables*** to books by Toni Morrison, Alice Walker, and Maya Angelou.

There are light moments in the portfolio as well, as when Marlena explains her efforts to conquer aerobics with a Jane Fonda tape (physical challenge) and when she reviews ***The Marriage of Figaro*** and ***Die Fledermaus*** (arts and aesthetics). After a detailed accounting of the two operas' outrageous, silly story lines, Marlena notes, "The plot is out of a typical soap opera: adultery, masquerade, and devilish plots to get someone under their thumb. ***Die Fledermaus*** and ***The Marriage of Figaro*** are two of the most delightful plays I've seen in a while."

In Marlena's autobiography portfolio, a collection of three essays, these many

interests come together and we begin to understand her as a person. The first essay talks about her love for books and how reading has helped her develop her own identity. In excerpts we learn:

> I would say books and learning to think for myself instead of listening to my "friends" is what made me an independent and diligent worker. . . . Books by Alice Walker, Toni Morrison and other authors captured my interest and urged me to read and made me grow to be a person that I like. . . . Books have given me a broader look at my surroundings: (especially) being able to enjoy various books on different subject like black families in the 1950s-1970s, in which I could place myself in the family member(s) position.

"I couldn't do that with the characters in ***Sweet Valley High***," she notes wryly.

The second essay discusses the importance of a good education and examines the historical restrictions in education that women and minorities have faced. Marlena weighs the arguments for education in terms of economic gain as opposed to gaining a better understanding of people and oneself, concluding, in consonance with one of the CPESS commitments, that "education is what you make of it and that it is more than school. Real education is the experience you have in order to do well in whatever field you go into."

Her third essay begins with her research experiences in studying cancer-causing genes and leads to a poignant discussion of her relationship with her grandmother, who died from cancer. She concludes with a realization that her decision to seek a career in medical research was a legacy left by her grandmother, who "helped me to develop and see my own strength and potential." And in a comment that suggests her appreciation for the CPESS Habits of Mind she has come to value, Marlena notes that her discussions with her grandmother "became good practice for encounters and experiences I would have. I started to be able to defend my position, my point of view, while being able to accept and understand someone else's."

The portfolio, as a whole, gives one a sense of Marlena's capabilities and concerns, as well as her knowledge and skills. We come to understand her passions and to sense her deep inner keel, which guide her in her path through life. The portfolio collection also displays a great deal about the kind of education she has received and the kind of thinking and caring she exhibits as a result -- her Habits of Mind and heart. Reading through the collection is an engrossing and moving experience. Though the entries are carefully scored ("gridded" in the evaluation terminology of the school), after a short time one ceases to attend to the assessments of others, learning much more about the student by engaging the work directly, and considering what it illustrates about who the student is and what evidence it presents about what she knows and has done in each exhibition.

CPESS students like Marlena bring much of themselves, their passions, and their concerns into their portfolio work. Among the many topics for portfolio entries are the

following: "Internship Blues: Dealing with a Scissor-Happy Editor," "The Use of Power in ***Antigone***," "The Women in ***Othello***," "Slavery: The Struggles and Hardships of Black Women," "Education in South Africa and Cuba," "Geometric Home," "Time Dilation in Einstein's Special Theory of Relativity," a science project entitled "A Comparison of the Effects of Hair Straighteners and Hair Removers on Skin and Hair," "Black-on-Black Crime" (a videotape), and "The Effects of Alzheimer's Disease." The personal concerns students bring with them to these topics translate into a motivation to dig deep and to persevere through the hard work that the challenging projects typically entail.

Reaching a "Portfolio Standard"

During their time in the Senior Institute, students work closely with their advisor and other subject matter teachers on each of the chosen portfolio items and revise them until the student and his or her teacher feel the work meets the standards of the school. The curricular goal is for students to "use their minds well" rather than to memorize bits of information. As a result, the Senior Institute courses emphasize inquiry and offer students a wide range of possible topics for their graduation portfolios. Students can also develop portfolios from their internships and college courses or from other interests that they pursue on an independent-study basis. Regular Senior Institute coursework can focus on or aim for the portfolio if students want it to. If they structure an assignment from one of their courses appropriately and work hard enough on it, it may reach "portfolio level," thus helping them to achieve their goals more quickly.

Mardi Tuminaro, for example, has structured her human physiology course to get students "doing science" as early in the term as possible. She presents an overview of the course's content first, to inform the students so they can select a topic to research. Students may choose to do a library research paper or an original research project. She has found that students are more intrinsically motivated by portfolio projects than by tests. The students actively seek her out for assistance with their portfolio work. The projects provide the students with tangible goals that help them focus their energy on the task they have chosen. Their interest motivates them to raise their own standards for their work.

Math/science teacher Edwina Branch notes that "developing standards for mathematics or science portfolios makes teachers think about what they're doing in their classrooms." She and her colleagues have revamped the kinds of projects they expect from students so that they are closer to "what we all said we wanted as a standard for the kids," and she uses the scoring grid continually as a way to talk to students about the criteria they should be applying to their work. For Edwina, reaching a portfolio standard means applying the standards for authentic work that would be applied by professionals in the field of mathematics or science. In science she finds that she engages students in more authentic kinds of experiments:

> The kids have to write up lab reports in the way that I think a scientist should do research. I remember when I did labs when I was in high school: They

gave you all the instructions and they had some questions and some little blanks and a little table all set up for you, and you just did exactly what they said to do. It was just going through the motions. I try not to do that. I give them the general gist of what they're supposed to do. I ask them to write their own procedures. I don't tell them what the tables should have in them. If they understand what data they should be collecting, they should be able to figure out what information should be in the table and what graphs they do and just how the procedure would go so that it is the best for the question they are trying to answer.

One of the things I want them to get in the habit of is working so that somebody should be able to recreate what they've done. They have to use clear language when they describe their procedures so that they can explain to somebody else how to do it. Because what good scientists do is repeatable. A scientist doesn't just do things in a vacuum on his own. You have to answer to the entire scientific community, which I guess is the science community's mode of assessment. That's their accountability measure.

Students come to understand the standards against which scientists measure their own work as they work on their science portfolios. Keisha's* science portfolio (included in Appendix 1) illustrates Edwina's success in helping students understand how scientists think. In two separate experiments, Keisha chose to investigate phenomena that affect her daily life and intrigued her: the effects of hair straighteners and hair removers on hair and skin, and the different effects of microwaves and infrared rays on food. Her careful enumeration of materials and procedures, her keen observations, her clear and graphic displays of data, and her thoughtful, evidence-based conclusions demonstrate that she has learned to think scientifically and to inquire into phenomena in the way that scientists do. Her ability to generalize these understandings to other kinds of work is also seen in a careful, step-by-step description of the making of a video documentary for her mass media portfolio.

Keisha's portfolio also illustrates how students come to understand the uses of mathematics and science in daily life. She uses an understanding of accounting principles, measurement, and statistics with competence and ease, not only in her science portfolio, but in her discussion of her internship at a brokerage firm, her design of a house to scale, and her discussion of the relative effectiveness of birth control devices.

Edwina explains that she uses mathematical modeling in her courses a great deal because as an engineering major in college she learned that that is what mathematics is used for in engineering: "to model some real situation. You can use math to model a storm or the stock market. So the projects the kids do are often based on mathematical modeling." This also allows her to make frequent connections between math and science concepts and applications.

There is a practical standard that is also valued at CPESS -- the ability to critically

evaluate ideas and information, to assess the credibility of their source and their basis in fact. Students' portfolios are full of such analysis across a range of subject areas. Edwina describes how she strives to reach this standard in mathematics. She notes that, having seen Ross Perot in a recent televised presentation display a set of graphs that used distortions in scale to make his point, "I was wondering whether our kids could tell this was manipulative. I think they could. But I don't think most people's mathematics education would have prepared them to argue with anything Ross Perot said."

Understanding things deeply is part of reaching the portfolio standard. This is why the oral defense of portfolios is a critical part of the process. As Marlena* explains, "It makes you understand it more if you have to explain it to someone else." Francisco* notes that since different members of the graduation committee have different strengths and perspectives, you have to be able to explain your work from a number of vantage points, thus requiring an even greater understanding of the work. "You have to be a teacher to the other teachers," he observes.

The comments written in the margins of a gridded portfolio provide a sense of the kind of understanding sought. Shawn's* science portfolio, a paper on monochromatic laser light, includes both a theoretical discussion and a computer program he created to model light waves under different conditions of interference. The questions in the margin, like those in the oral defense, probe for evidence of deep understanding:

> Why does the light keeps its intensity over long distances? What is it about laser light that makes it travel in a straight line? Why is it important that a laser beam is monochromatic? How do you make a laser monochromatic? Can it be adjusted?

This paper received a rating of "distinguished" by the reviewers, as did the oral presentation, with a high degree of reliability among raters on each of the grid's categories (e.g., all of the raters thought the paper "exceeds standards" for viewpoint [knowledge represented] and voice; all of them rated it slightly lower, as "meets standards," on evidence and use of conventions). The final rating is determined by how well the student displays his or her understanding in the oral presentation and defense as well as what is represented in the paper. In this case, the presentation illustrated Shawn's command of the material, even where his paper was not entirely clear.

As the process of preparing a portfolio unfolds, students learn a great deal about writing, critiquing, and revising their work, since this is generally required before portfolio standards are reached. The advisor gives some insight as to when a piece of work is "ready." As in the case of grading criteria, however, students know that self-evaluation is also an integral part of the assessment process. Thus, the process itself is a learning experience for the students, providing them with specific, concrete feedback that they can use to improve their performance.

The Assessment System in Action

The Senior Institute and its performance-based assessment for graduation are not an add-on to the school curriculum, or a trendy, unconnected top layer. On the contrary, they draw their potential for effectively transporting students to the next stage in their lives from the assessment practices and experiences of the school community -- teachers, students, and parents -- over the four years prior to entrance into the Senior Institute. During those years, when students are in Divisions I and II (the equivalent of traditional grades 7-10), there are at least two major conferences annually that include the advisor, parents, and student. The conferences center on the student's work, samples of which are presented along with different teachers' narratives evaluating the students' work and progress. Meier says: "With the CPESS conference, there is the possibility for a real exchange -- the kid is there, the work is there, everything is there to carry on a conversation."

The work in their earlier years also prepares students for what they will later encounter. Keisha* notes that "since seventh grade, we've been doing our own research. It motivates you to do more and to push yourself." Exhibitions were always part of assessment in the lower divisions. In recent years, portfolio assessment has also been developed by teachers in these grades as a means of having a more cumulative and wide-ranging conversation about students' work and progress. Meier notes:

> After four years of lots of conversation around your work, hopefully kids can say, "I understand what they're trying to get at," and they're buying it. "I know what the rules of the game are, and I know how to be more successful. I know when I need to get more help, I know the range of people who can help me, and I have some goals of my own." Hopefully when they enter the Senior Institute, that shift has begun to take place.

The graduation committee process extends and expands this conversation and formalizes it through both the student's oral defense and the committee's discussion evaluating the portfolio and presentation. Because students and parents have direct access to and participate in the evaluation process (parents can and frequently do sit on graduation committees), and because the process, not just the result, is public, not secret, evaluation and "readiness for graduation" are demystified. Demystification empowers students to succeed while increasing their own responsibility to do so. As parent Darwin Davis notes:

> By the time the students got to the Senior Institute, it was very clear you had to complete 14 portfolio items, here are the range of materials you have to master -- and it was about mastery, it wasn't just about a comfortable competence or enough regurgitation to get over on a particular teacher or class or group of teachers. It was clear that you had to display mastery in these different areas, and you had to be able to document that mastery and you had a range of ways in which you could do that -- you could make oral

> presentations, you can make diagrams, you could do a videotape, you can get together with your colleagues and do a roleplay -- but you have to master material and you have to have a command of that material and you have to defend your command of that material just as people do in their dissertations.

Supports for Student Learning

Students attend a retreat in the spring of their final year in Division II as part of their preparation for the major shift they will undergo the following school year. Entrance into the Senior Institute is marked by a formal welcoming ceremony the following fall and a parent meeting to discuss what students must accomplish in order to graduate. This knowledge of what is required and the broad range of strategies for demonstrating competence are empowering for both students and their parents, who can play an important role in the process. Davis articulates the parents' view:

> In your typical school, parents are very disconnected from the process of what their children need to graduate. The requirements for graduation are much clearer in a CPESS kind of setting than they are in a typical school. It's very much different than "did you pass your midterm? did you pass your final? and did you turn in all your homework assignments?" Though that is finite in some ways, it's very limiting in others. It's limiting in the range of knowledge that is tapped from the student to document their so-called academic work. In CPESS the range is much broader, students had a better opportunity to find something positive in their skill repertoire to feel good about, and therefore to have a successful school experience. CPESS doesn't limit children in [the way traditional schools do]. So [the portfolio process] is something that helps parents see who their children can become. . . . You can be a terrific team organizer; you can be a peer counselor [conflict mediator]; that's a valuable role in a school setting. Those are valuable roles that aren't often discovered in the typical school setting. All of these are proactive things the school did to empower parents as well as students.

The advisory system is another empowering aspect of the system. All students at CPESS belong to a 12- to 15-member advisory group guided over the two years in each division by an advisor, who is any one of the staff members of the school. Advisors meet with their advisory group each day for at least an hour to discuss a variety of issues, ranging from health, family, and community issues to concerns about school. For Senior Institute students, the time is largely spent on homework or portfolio work as well as on individual counseling or college planning. Virtually all staff members, including the school's co-directors, program coordinators, counselors, and teachers, take responsibility for an advisory group. This keeps all of the adults closely connected to students and their families, and it allows for the personalization -- and always-available safety net -- that CPESS students experience. Keisha explains that her advisor "calls my house and talks to my mother." The advisory group "becomes a close-knit family," ensuring that there is "somebody who cares and somebody to rely on. . . . They will make you do the work."

Getting Focused: The Postgraduation Plan

The Senior Institute advisor meets with each advisee, and later the family, to draw up a postgraduation plan, often affectionately referred to as "Is there life after CPESS?" The plan includes a time line of the student's key life events from birth to date and continuing 10 years into the future, with a discussion of what kinds of career options the student may want to consider and colleges he or she may consider attending. Senior Institute teacher Joe Walters talks about the students' initial rush of excitement when they do the postgraduate plan: "We look at career possibilities, maybe doing an interview with someone in a field you're interested in or researching colleges that have the kinds of programs that you're interested in." Internship placements and a series of advisor-organized visits to colleges around the country,[8] along with participation in college courses, help maintain this excitement and give it direction, focus, and a sense of the possible for students who would never consider options they could have had no chance to envision.

Tarik*, one of the first class of seniors, explains how the school opens up students' horizons:

> I know people who started out with me who at first were saying, "No, I'm not going to college." But after being in this school and going on these trips and seeing these different colleges and how positive it is, by seeing it themselves, they get a different perspective. And they started to realize that this is what they needed to do if they wanted to be a doctor, lawyer, or be in business. You'd be surprised how many kids changed their minds over the last five or six years.

Kamil*, a fellow senior, also recalls students who decided to go to college because their experience at CPESS enabled them to "have a higher standard for themselves."

Francisco* has considered his talents in art and music and has researched schools that would allow him to pursue these interests. As a student previously identified for special education services, Francisco has struggled with some courses, but his appreciation of his own strengths has enabled him to consider the future without discouragement. He notes:

> I hope and pray that I will enter to college at the end of next year but if I need to take another year I will because I would rather be better educated than not to be. I also think that it would be in the best interest for me to work on a portfolio of all of my work and I would show it to the colleges of my choice. I will accomplish this by talking to my art teacher and get [*sic*] all my work together.

His portfolio includes several entries that are rated "distinguished," including his

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[8] All students have already visited at least one college each year on advisory trips in Divisions I and II.

autobiography, which movingly describes a near-death experience as well as his attachment to music and art, a set of self-portraits, and an audiotape of him playing Beethoven's "Moonlight Sonata"; portfolios in geography and physical challenge; and a "college art" portfolio. As we learned later, Francisco graduated on time and went on to a college that had been on his list.

Keisha* was ahead of the game. Her highly detailed, carefully considered plan notes:

> Because I have met the requirements of all those schools which I plan to apply to, I feel it is possible that I will be finished at the end of the third semester. This will leave the fourth semester for another internship and numerous visits to different colleges.

Her time line informs us that she had received the Intern of the Year award in tenth grade for her performance at Shearson-Lehman Brothers brokerage firm. Her transcript shows that she completed all of her Senior Institute coursework by the third semester, with high marks, especially in mathematics courses, and took another college course during her final semester while defending her last few portfolios. She notes in her postgraduation plan:

> I enjoy mathematics and do very well in that academic field of study. I also enjoy creating things that challenge me to think and really use my mind. As a result I am thinking about pursuing a job in the following fields: Accounting, Engineering, Management, Film Work/Production Co. While three of the four choices above run along the same lines, the last choice is a little different. I find that while I enjoy mathematics, I also enjoy film work. This became visible to me when I took part in the production of a documentary for a class project and once again when I was Production Assistant in a friend's production company. . . . My goal is a Bachelors degree. It would also be to my advantage to take an internship in that field.

Keisha, too, went off to one of the colleges of her choice, feeling well oriented toward the new choices and options awaiting her. The planning, all of the students agree, pays off in helping them define and successfully pursue their goals.

The postgraduation plan also helps students select their courses, plan an internship, and think about portfolio possibilities with clear goals in mind that connect to the student's own talents and interests. In the plan, students describe what kinds of projects they hope to undertake and when, mapping out a schedule for completing and defending each of their portfolios. Many options for portfolio projects come up in class. Teachers often provide ideas or respond to students' ideas, explaining what a topic and project would entail so that students select ideas that will interest them and sustain the energy that a completed project requires. Since their work will be judged on the presence and conviction of voice, as well as mastery of information and analytic skill, student interest and engagement in a portfolio topic are crucial.

Developing the Portfolio

When students must turn their efforts to the development of portfolio items, the excitement often turns to anxiety. It is at this point that the shift from dependence toward increasing independence begins to become apparent, and the interaction between the students and the school community is crucial in determining success and keeping students from falling through the cracks.

After selecting a topic, students begin work on portfolio items by doing research. Different students have different strategies for developing their work. Michael*, a senior, describes his strategy as making an outline with an introduction, body, and conclusion, and "getting a whole lot of information" before he prepares a written draft. Students submit their portfolio projects to the appropriate subject teachers, who return them with comments. Students revise the projects and resubmit them. Monique's* comment reflects the fact that this process has begun to instill a sense of pride in the quality of the work that overrides the traditional desire to just get it done: "After you finish a draft, you hand it in. It's good to hand it in before the deadline because then you get it back in two days with the teacher's comments, and you can work on it again."

The teachers evaluate the projects using the 20-point grid scoring system and return them again. Michael's advisor "will accept nothing less than 15. If you get a 15 or above, you can bring it to your graduation committee and present it. If you get under 15, you have to rework it." Michael maintains that most students revise their portfolio work tnree or four times before they present it to their committee.

When portfolio submissions are evaluated by the entire committee, each committee member scores the portfolio on the 20-point grid (a possible four points for each of the five Habits of Mind); they then put their assessments together for an overall rating of distinguished (18-20), satisfactory (15-17), or minimally satisfactory (12-14). Below this level, the student must revise the portfolio and resubmit it for another evaluation. Oral presentations are evaluated on the five-point scale shown earlier. Although the grid provides structure and makes criteria explicit, evaluation of the total product is holistic. Evaluators often work back and forth between the individual subscores and the total score to see if their overall judgment of the work is sustained by -- and reflected in -- their assessments of its various aspects. Ultimately, the committee members must ask themselves, individually and collectively, whether the portfolio is good enough to stand up in what Meier calls the "Court of the World."

The value of the grid in making standards and criteria explicit is acknowledged by students and staff alike. Edwina Branch notes that "I use the grid all the time as I talk to kids about their criteria." Explicit criteria help the whole school focus on its mission. Branch recalls that when she first came to CPESS,

Teachers pushed each other to answer "Why are we doing this? And what do

> we want kids to get out of it?" [The grid] is understood to be something we need as an entire school. . . . I can't imagine right now trying to teach without thinking about assessment all the time. It's easier to be in your own little world and not be accountable to anybody. It's much easier for me to be in this room doing what I want. But it's not the best thing for the kids, and it's not really the best thing for my teaching.

For staff, learning occurs as they evaluate student work and consider how to develop and support it. Noting that the level of conversation about learning at CPESS is leagues beyond that in her previous school, Branch observes that she feels sorry for other teachers who do not have the opportunity to participate in such a discourse about teaching and assessment: "Going through the process of creating the grid and all the rest . . . made me what I am. I think that makes all the difference in the world."

Learning by Doing -- and Redoing

The process of evaluating and revising and reevaluating makes the assessment process a learning process, one that promotes both self-evaluative capabilities and habits of work -- the internalization of standards -- for students as well as staff. For students, tangible improvement in their capacities and skills is another by-product of the process. This is especially obvious with writing. The typical portfolio averages 50 to 100 pages of typed material, ranging from essays and annotated bibliographies to extensive research papers. Almost all of these are products of a process that includes several revisions enroute to the portfolio. As Walters observes, students "who write a lot see a change in their writing. They see their abilities transforming." In addition to the fact that they see their skills improving, students learn that they can take charge of extending their own abilities. This makes possible life-long growth and learning, along with the self-confidence needed to tackle new arenas in which practice will be needed before success emerges.

As they begin to make the big shift, many students initially look to their advisors to help make them take responsibility. Resource room teacher Jill Herman says that sometimes the metaphor of "teacher as coach" could more accurately be called "teacher as nag." "I've had kids who will come and say, 'Look Jill, you yell at me. You make me sit down. I want you to make sure that I do this.'" Students comment regularly about the availability of their teachers and their desire to make sure they succeed. As another remarks about her advisor, who is also her chemistry teacher, "She bothers me. She gives me the 'what to do' and I have to do it. And if I don't understand something, she's there, just her and me and she'll explain it to me in a one-on-one."

Students can begin filing and presenting portfolio items as they complete them whenever they feel ready. Often, getting through the first graduation committee defense is what it takes to get students to feel competent and capable of completing what seems to loom as an interminable amount of work requiring more self-direction than they have been used to. Joe Walters explains how taking the plunge is frequently both difficult and essential to

gathering momentum:

> Some kids who had done well previously had difficulty during the first semester because their exhibitions and portfolios are no longer done only within the context of one course. They have to get ready to present to their committee. . . . I had three kids who did not do their first graduation committee until April of last year. It was interesting to me that once they did that graduation committee and they had those two or three portfolios they were finished with, then somehow they were freed up to say, "Hey, I can really do this." But getting it going to that point of the first committee provoked a fair amount of anxiety.

His description is confirmed by many students. Students are also emboldened to present their work by sitting in on the graduation committees of other students, where they can see the process in action and learn more about how to present and how to evaluate their own work as well as the work of other students. Here is Tamika's* analysis of what she learned from participating on a graduation committee:

> I learned how a student's paper is written, that every student writes differently -- some get into more depth, some have different viewpoints. . . . Sitting on a graduation committee really told me how to prepare for my graduation committee in the future. You see other persons' mistakes, and you tend not to make that same mistake.

When she participated on a committee rating the presentation of a geometry portfolio, Tamika learned what kind of criteria the teachers used in their assessment. "We talked about how well he explained himself, what he knew about geometry, why did he pick such a house this big or this small, why did he want so many rooms, why did he pick such a width." When this particular presentation did not pass muster, Tamika also learned about the quality of presentation expected: "I understood that you have to do a really good presentation to pass the portfolio . . . you have to really focus on what you have to say." Her later experiences with her own committee built on her experience as a member of another student's committee and developed her capacity to look metacognitively at her own work and learning process:

> I can present and defend as long as I know what my paper is about. I know what my paper is about by reading it over and over and getting a sense of what it's about. I take notes, look for viewpoints and key words, then I just start talking about what it's about, how did I get this information.

The Committee Process

As Tamika's comment suggests, the presentation is a key event in the learning process. It provides an important goal. It crystallizes and deepens the student's command of

his or her work. It provides an occasion to demonstrate that mastery to friends, family, and members of the CPESS community and to oneself in a public setting guided by clear standards of performance. And it balances rigorous standards against a need to enable each student to experience eventual success. The presentation is not a one-shot event that makes or breaks a student's chances for graduation. It is part of a continuum of work and exhibition that is grounded in an assumption of and commitment to continual improvement. If a presentation or a portfolio item is deemed not ready, it does not die; instead, it goes back to the drawing board with specific suggestions for improvement.

The guidelines for a committee meeting allow five to 10 minutes for the student's presentation, 20 minutes for the "defense" when committee members ask the student questions about his or her portfolio, and 10 to 15 minutes for the committee's discussion and assessment. Students and their parents may request access to the committee's discussion and assessment meeting (CPESS, 1991, p. 21). Students may re-present if their presentation is not satisfactory, or they may choose to re-present if they decide they would like to earn a higher score. The process maintains high standards while providing multiple opportunities for success.

The assessment process provides a learning experience that builds students' insights and confidence. It becomes what Walters describes as a self-fulfilling prophecy: "As kids get better at defending their portfolios and as they see themselves getting better, they get better." Students, faculty, and parents confirm the power of the oral presentation and defense of the portfolio before the committee. Overcoming a phobia about public speaking, Danielle's* first oral defense is a case in point.

"Who am I?" begins Danielle's autobiography. "I am," she continues, "my mother's body, shape, and narrow slit eyes. I am my mother's daughter. . . . I am my mother's hope that one of her children will graduate from college." Danielle's essay develops the theme of her mother's influence, help, and support during her younger years in Catholic school where she fared badly and learned to be afraid to talk, through her teenage years when her mother worried about Danielle's getting into trouble. Seated along with three other committee members is Danielle's mother, focused intently on the presentation and the other portfolio research papers on the constitutional right of women to abortions, the appointment of Clarence Thomas to the Supreme Court, and the meaning of the veil in Middle Eastern Islamic society.

The fluency, voice, knowledge, and detail so apparent in Danielle's written work is absent from her presentation and defense. Danielle reads from the note cards she prepared with the guidance of her advisor, Haven Henderson. She answers committee members' questions first with single words and then with single staccato sentences that cling to her short, rapid breaths. But despite her terror, resistance, excuses, tears, and failed manipulations to delay this event, she is presenting and defending with her mother, her lifelong support, witnessing her first attempt to speak in public.

All of the committee members rate the portfolios and presentation privately and then share their ratings. All are aware of Danielle's fear of public speaking and believe that this presentation is a good start for her. The committee agrees on a rating of acceptable ("MinSat") for the oral presentation, although the portfolios receive higher marks. The presentation is acceptable only because it is the first one. There is a discussion of Danielle's fear of public speaking with her mother providing a history of it, although not an excuse for it, and expressing her gratitude to the other committee members for both their sensitivity and their demands. When Danielle reenters the meeting room, Henderson informs her of the committee's ratings. She is relieved and pleased. Henderson explains that she expects more and offers specific suggestions for the next presentation -- "Give an overview. Highlight important points in your paper."

Danielle's mother also expects more. The presentation and defense were not adequate representations of Danielle's ability or effort. She has always been an A or B student, and her mother expects her to conquer her fears so that she can express herself as she advances in the portfolio process. Danielle's mother is grateful to have had the opportunity to see her daughter present her work. She understands her daughter's pain and struggle -- and her progress -- and she now has a deeper understanding of what CPESS expects and the form that the expectation takes. As she gains firsthand knowledge of the skills required, she knows she too can become a more informed support for her daughter.

Senior Institute teacher Joe Walters sees the committee process as a transformational experience for all students:

> I think one of the best things about the portfolio process is the defense before the graduation committee. I see incredible changes among kids. Before they go into their first graduation committee they're so nervous. They find it difficult to develop and defend a portfolio. It's much harder than a paper and pencil test. Sometimes kids are clear and sometimes they are not about what the process involves. And after they've done one or two of them, there's a transformation on how they feel about the process. They get better at it as they learn the process. And definitely, they do buy into the process. . . . There's a qualitative change between the first year Senior Institute student and the second year Senior Institute student. The improvement from the earlier defenses to the later ones is astounding. There's a seriousness that develops over the course of the two years -- an ability to focus and stay focused. They get more involved in how much effort and work they put into the later portfolios. All of the teachers say this.

The graduation committee process is extremely powerful in a number of ways. For one thing, it brings focus to the educational experience. As Darwin Davis explains:

> It was certainly in my mind the clearest and most focused time that I had as a parent, knowing what the expectations were of my daughter in terms of her

> academic work and performance. I had a clearer sense of what the expectations were during that process of the assessment, working on the evaluation team, versus any other time in her academic career. It lays it out fairly clearly for the student as well. This is the goal I must reach. And not only must I reach it but I must be able to convince five other people, some of whom are selected, that this in fact reflects the capability that I have to bring to this particular subject area.

The activity around and in the committee makes it one of the most significant learning experiences for the students who are candidates, for other students, for the staff, and for parents. It is in these committee meetings that all the members of the CPESS community can see the fruits of their labors. It is a sort of moment of truth for all involved in the teaching and learning process. There is no escaping what worked, what has not worked, and what needs more work.

Parent participation on the committees becomes a source of learning and feedback for the staff as well as a powerful affirmation for parents of their children's achievement. As they witness their children demonstrate their knowledge, and they witness the teaching and learning that determine their children's future, parents are brought into the fold of the secret world of school that too often gives parents access to their children's education only through proxy grades, reports of things gone wrong, or children's tales.

One parent explains how the parent and student roles on the committee bring a special kind of knowledge to the process:

> I think the parents' input is crucial in that they probably have a better sense of the overall child than anybody else -- the social strengths that child may or may not have; that ability to express him or herself; that ability to operate under stress and pressures and those kinds of things; and what influences might sway their child in a particular direction, positive or negative. And I think that input is key in the academic role. I think it's also important that there's that peer representative there too because that peer probably has a better grasp of those social relationships, positive or negative, than anybody else. I think each brings a unique perspective.

Part of the power of the graduation committee process is that, as Meier explains in an interview, it is itself an expression of the Habits of Mind while it strengthens the accountability of community members to one another.

> It's an act of judgment. It reminds kids that we're making decisions here. You and me, we're making judgments. . . . You've got to persuade us and we've got to persuade you of our case if we give you an assessment different than you think. . . . The notion that everybody's got to make persuasive cases, they've got to bring in their evidence, they've got to prove their point -- that's

built into the life of the school. It's not just a pedagogical principle. It's actually how we run the school: evidence, perception, all these five Habits of Mind are not just on the side here. They're how everything operates.

Students are neither passive nor powerless in this process. They are encouraged to use their own capacities to persuade the committee of their point of view, of the meaning of their work, and of their convictions about its value. The process is totally open, to them, to their parents, and to their advisor, for scrutiny, for argumentation, and for understanding. No judgment is made lightly or mechanically. The committee takes responsibility for the fairness and thoughtfulness of their own decisions, and for the persuasiveness of their reasoning.

Committees do not always agree. In one case described by a committee member, the math teacher had one view of a mathematics portfolio, seeing the work as acceptable but less than distinguished; the parent was even tougher, arguing that his daughter could have applied herself more; while another teacher was more empathetic: "Gee, it's math, afterall. I could only do so much of that myself." In these cases, there are attempts at negotiating a settlement while providing feedback that gives the student a clear direction. "It didn't happen often," the committee member explained, "but there were those logjams where you just didn't have the commonality of view and methodology, so therefore we couldn't make a decision at that point in time. We had to go back and do more homework, so to speak."

Committees take their responsibilities very seriously, so that students can have confidence that they and their work have been well considered. Students agree that when they choose to ask their parents to serve on the committee, the parent is often the most rigorous critic because he or she knows certain things about the student's capabilities that the staff may not have had a chance to see. Having a mix of faculty with other members allows each to contribute a perspective, to balance each other out, and to seek a fair judgment. And no decision has immutable consequences. There is always the opportunity to revise, revamp, and try again.

This mutual accountability -- school to student and student to school -- symbolizes the dignity afforded to all members of the CPESS community. Everyone must play by the same rules, and all judgments must derive from the weight and power of evidence. Thus, the committee is a real as well as a symbolic enactment of the school's beliefs and values, and of its commitment to accountability grounded in community. An important aspect of this communal accountability is the sense of responsibility that teachers have for the success of their students. Ultimately, the power of the graduation committee and the portfolio process is that they give both teachers and students challenging goals to work for, and they illuminate areas in which teaching supports are needed to ensure student success.

Monique's* experience with her literature portfolio illustrates how this process helps increase student involvement and commitment. Despite her complaint that the Senior Institute demands more of her time than what she wants to devote to it (given her professed

interest in boys, fashion, and other social priorities), Monique is proud of the "Distinguished" rating she earned for "The Use of Power in ***Antigone***," a book she describes as her favorite in all the world. Monique earned the rating, she says, because of "the quality of the writing and the dedication that I put into the paper. It showed that I believed what I was writing about."

Authentic Assessment in the Life of the School

Authentic assessment practices come alive in a school as part of an organic process of goal-setting, communication, collaboration, and learning. The value of these practices when they are developed from within a school community is that they are owned by all of the members and can be a source of continuing inquiry into student learning and reflection on practice.

At CPESS we observed influences on parent-school communications, as assessment practices help make the aims of the school and the work of the students concrete. The portfolios and graduation committees provide a useful structure for an intensely educational dialogue between staff and parents, one that truly makes parents partners in supporting their children's growth and learning.

There are other influences on curriculum and classroom practice. The portfolio graduation process has occasioned efforts to deepen and strengthen curriculum throughout the school and to stretch teaching practices to find even stronger connections between challenging intellectual content and students' talents, experiences, and interests. Staff in the Senior Institute are always examining ways to increase supports for student success on the portfolios, while staff in the lower divisions, who also sit on graduation committees, have begun to think about how to lay the groundwork for their students' Senior Institute years.

Because the Senior Institute and its graduation requirements grew organically as the school and its students grew (CPESS added a grade each year as its first cohort of seventh graders progressed), the requirements do not differ in kind from the nature of the work students have experienced before eleventh grade. In the lower divisions, exhibitions are used as assessment tools in many classes. For example, in a Division II math/science curriculum unit on motion and energy, students study such concepts as velocity, acceleration, and projectile motion using data, equations, graphs, and trigonometric functions to answer several essential questions. These include: "How do things move?" "What is motion?" and "What happens to the motion of two bodies when they interact?" The students will not, however, be able to answer these questions with definitions or pat answers copied out of a text. Instead, they will need to present a research paper and an oral presentation demonstrating that they understand and can use these ideas for their own purposes. Among the exhibitions they might select are the following:

- design and analyze an original realistic amusement park ride
- analyze the projectile motion of a sports activity (e.g. the trajectory of a basketball)

- using a particular piece of computer software, analyze the horizontal and vertical velocities of a body in horizontal motion

These kinds of activities help students integrate academic knowledge with hands-on applications of mathematical concepts and scientific principles; they encourage deep learning involving creativity, invention, and analysis; and they help students begin to acquire the Habits of Mind needed to succeed not only at CPESS, in the lower divisions and the Senior Institute, but in the world beyond school.

Exhibitions of this kind have become even more prevalent in Divisions I and II, where teachers help students begin to work with the kinds of criteria that will be applied in the Senior Institute. In some classes, there is more emphasis on developing research skills -- how to find and use sources, how to structure information, and how to think about what else you would need to know in order to fully understand a question. Attention to the teaching of writing has increased as well, along with opportunities to present work products in a variety of forms.

The portfolio takes the concept of an exhibition a step further. Portfolio work can include a series of projects that require even greater intensity of effort and even greater connections to the student's developing sense of self. As Senior Institute teacher Jeremy Engle puts it, the idea is that

> your work is a window into your Habits of Mind. What's important are the Habits of Mind, habits of heart, and habits of work. You want to see the entirety of a student's work. You want to ask, "Why did you pick these pieces?" You want to know if kids have a sense that the portfolio reflects them.

At the same time, staff understand that the portfolio reflects their own success at helping students find and develop themselves and their talents. Engle talks about the questions staff raise as they explore and construct the possible meanings and functions of the portfolio for themselves and their students: "What do portfolios mean?" "How do we organize class for portfolios?" "How do we avoid teaching to portfolios as people used to teach to the test?"

In quite remarkable ways, assessment development has served as a vehicle for staff development and for school development. It has provided a concrete, student-centered focus for staff collaboration and shared learning with student work at the center. The negotiation and use of standards has served to strengthen shared goals and values, and the sense of the school as a whole entity with a common direction.

Faculty find that the assessment process raises a slew of broader school questions: What kinds of structures and processes -- over the six years of life at CPESS -- does the school need in order to ensure that students develop the capacity to produce portfolios of depth and quality? What must happen within existing classes? What must happen outside of

classes, in advisories, resource rooms, and elsewhere? Are new courses or technical assistance strategies, such as research writing labs, needed?

In other words, the faculty is fully aware that a new kind of assessment system requires a new kind of system to support student achievement. One cannot assume that students will have the skills to succeed in a new system simply because it is more authentic, any more than one could have assumed that students possessed the skills to succeed under the old system. In fact, the skills they need will probably not have been developed under the standardized testing system that predominates in many schools, and changes in practices and supports for more in depth learning will almost certainly be required. CPESS has undertaken such changes in the various structures and practices it has developed for advisement; for in depth, integrated coursework; for collegial work and planning; and for the work with families described earlier.

As new needs emerge and as standards are raised by virtue of the learning that occurs within the school, the assumption at CPESS is that collaborative change creates new possibilities. Rather than feeling threatened by or defensive about feedback and scrutiny, teachers and students are energized to find solutions to the problems revealed. CPESS staff have participated in innumerable professional development retreats to rethink curriculum, evaluate external standards such as those offered by the National Council of Teachers of Mathematics (NCTM), and refine their internally generated standards and curriculum plans. They have revised and continue to revise the school schedule so that teachers can provide greater support for students. Jill Herman notes that teachers have learned that coaching must be structured -- a combination of leading, supporting, stimulating, locating resources, and helping students find ways of organizing themselves -- so that students are not overwhelmed, while leaving them enough room to initiate their own work.

While issues create a dynamic for change throughout the school, the graduation process has had broader influences on the school and its work. As faculty work through portfolio evaluations together, they are wrestling with articulating their individual standards for what constitutes good work and useful learning, and they are developing shared standards that drive an overall school development process in unseen but powerful ways. Meier notes that the process of working through portfolio requirements, standards, and evaluations leads to improvement of teaching across the entire school. By tackling the question of graduation standards with authentic examples of student work as the focus of the conversations, "We've created a school that's more collective in its practice."

Edwina Branch sees the assessment criteria as the motivating and organizing force for collaborative curriculum planning and for teaching. She argues that the standards for what students should know and be able to do are more useful as guides than requirements about content coverage:

> If we are clear about the criteria and the standards that we use, if the kids are clear, if the parents are clear, and if we are using them similarly throughout the school,

that's the thing the kids need to move on with. I almost feel like I don't need to know what content they covered in the other two divisions (though I like to know. . . . And that always used to be my thing -- I wanted to know what was going on in Division I and II so I could build on it). I don't need to build on the content. I need to build on the assessment process, because the assessment process has to do with what we want the kids to be as thinkers and as doers. So if they've been constantly told that problem solving and representation in mathematics is an important thing to do, no matter what I teach them they'll be able to do it because they'll know the process they need to go through to learn something and learn it well. The kids will be more independent in their learning and they'll be able to learn almost anything.

Assessing the Assessments

In the process of developing assessments, a dialectic emerges as educators must balance competing, equally valued goals and create strategies that address concerns for commonality and fairness, while maintaining flexibility and an appreciation of the uniqueness of students. CPESS has approached these issues head-on, striving to give each side of the dialectic its due and seeking out external review of its assessments to validate and improve its work.

In several sessions during which portfolio ratings were reviewed by staff along with outside evaluators from local colleges, a number of fundamental questions were raised: Is our system of assessment evaluating the things we think are important for students to know and be able to do? Are we using similar criteria when we assess student work? How are faculty's evaluations affected by knowing a student well? Should students with special needs be held to the same standards as other students? How do we achieve high standards without dysfunctional standardization? How can we assure the school community and external agencies -- colleges, employers, the state department of education -- that our assessment system is valid?[9] Even more important, how can we ensure that the process is useful to student learning and school development?

This last question -- how do we ensure that assessment serves our broader goals for student learning? -- tackles the important issue of consequential validity: What are the *consequences* for students and schools of using a particular form of assessment? This is a type of validity that psychometricians have recently begun to understand as critical to questions of test development and test use (Shepard, 1993). It is also clearly critical to questions of how assessment can serve to strengthen teaching and learning. If assessments do not call for forms of learning and modes of teaching that are valued by the school

[9] As New York State *Compact* Partnership Schools, CPESS and other partnership schools are creating their own assessment and accountability systems to lead and inform state policy and practice.

community, they will undermine the commitment of students and teachers and the confidence of parents and others to whom the school is accountable. As teachers tackle the question of consequential validity, they take charge of shaping the school and their collective efforts in more effective ways.

These fundamental questions and dilemmas have been worked through, for the moment, at CPESS in useful ways. They are also ongoing concerns that continually motivate serious discourse and revisions in teaching, learning, and assessment practices.

Achieving Standards Without Standardization

The CPESS portfolio system uses a framework with common areas of work evaluated using common criteria by a common process. However, it does not require uniform tasks based on predetermined, standardized "prompts" or responses. The balancing has involved staking out and defining common ground without setting it in concrete. There are at least two important ways in which this commitment is made real in the organization and in the assessment system.

First, CPESS maintains standards without standardization throughout its school program. Although students are never standardized, schools' efforts to find ways to treat them as though they are result in futile attempts to create homogeneous groups through such strategies as tracking. CPESS does not track students or segregate "special needs" students. The school is built on the premise that standards can be achieved without standardization, and it creates a variety of supports, such as the advisory system, resource room supports, and access to additional tutoring, to enable this to occur. Furthermore, students are encouraged to start from their areas of strength and interest in developing their portfolios. Thus, paradoxically, allowing students to begin from their different starting places helps them ultimately to reach more equivalent standards of performance. Resource room teacher Jill Herman notes that the portfolio process works for the students she is assisting:

> I think this concept of individual assessment is perfect for anyone in special education because that's what special education has always focused on -- establishing an individual education plan. The IEP is all demonstration by mastery. It's natural for us to constantly be finding ways for people to demonstrate that they know something. Our job is to figure out how to reach them, and then to figure out how they can show us that they know what they know.

Second, efforts to standardize assessment often lead to the breaking up of tasks and methods for scoring them into small, discrete parts. This process aims to focus attention on common dimensions and increase reliability, but when carried too far can decrease validity, by decontextualizing and fragmenting ideas and their evaluation. The CPESS portfolio assessment system recognizes the need to find manageable units and indicators for evaluation as analytic benchmarks for providing common consideration across students, but it also

accomodates a holistic assessment, recognizing that the whole is greater than the sum of the parts -- that the overall judgment that a standard has been met is ultimately more important (and more likely to be reliable and valid) than adherence to more discrete, standardized scoring criteria.

Thus, while there are 14 portfolio areas and analytic scoring criteria based on the five Habits of Mind, the portfolio entries -- and the overall portfolio -- are also evaluated holistically. The overall consideration of the student and his or her collection of work as a whole is not lost. Evaluation of whether standards are adequate -- whether they would hold up in the "Court of the World" -- is undertaken through ongoing external review of portfolio samples and of the portfolio process as a whole.

Balancing Objectivity and Subjectivity

In assessment, there is a press to be "objective," that is, to judge or score evenhandedly and reliably. Traditionally, this has been thought to be better accomplished at some distance from the person whose work is being evaluated, using standard criteria in the same way across cases. At the same time, an understanding of any phenomenon requires a certain amount of subjectivity -- that is, personal or contextualized knowledge of the work and its producer as well as of one's own valuing system. It is that subjectivity which is the basis for creating meaning out of everything we encounter.

There are at least two ways in which CPESS achieves a balance between objectivity and subjectivity: by recognizing context while maintaining commonalities, and by putting together a set of judges who can bring different sets of eyes to the student and the work.

In the first instance, the assessment process recognizes the importance of context -- the context of the task and the context of the student -- while maintaining the common framework for tasks and standards. A discussion of the task context helps the raters understand what a given piece of work means as a representation of a knowledge domain, as an application of a particular skill or ability, and as a piece of work in the context of the student's school experience (when, why, how it was produced, and for what purpose). The graduation committee discusses what the work means in the context of the student's growth and development -- for example, what other desired qualities like effort, perseverance, or a willingness to stretch into unfamiliar or challenging terrains were required for this particular student to produce this particular piece of work. At the same time, student work must fit within the requirements of the portfolio and is evaluated against common standards, guarding against too much subjectivity in judging readiness to graduate.

The balance between objectivity and subjectivity is also aided by involving some members of the graduation committee who know the student and his or her work well, and some who do not; some who bring intimate knowledge, and some who bring a bit of distance and a different perspective. The committee typically includes a subject matter expert for the portfolio being defended to evaluate the work against disciplinary standards, along with the

student's advisor, who knows the student well and who brings another disciplinary perspective to the table. A third adult provides yet another point of view on both the student and the subject, along with the student on the committee. The committee structure guards against bias and creates a kind of objectivity through multiple lenses or perspectives on the work and the student.

Balancing a Developmental View and An Evaluative View

Education is inherently developmental (educators care about supporting people in their process of becoming), yet assessment is inherently evaluative (assessors must assert a value regarding what a person, or at least his or her proferred work, has become). In the developmental sphere, there is no beginning or end, only a continuum. The evaluative sphere is bounded by time: Events and products are seen as the end point of an effort. Often the process of formal evaluation can interfere with development, by creating a new psychological frame that inhibits further growth and achievement. When an evaluative message persuades a child that he or she is "not good enough," it can create a demotivating effect, establishing a prophecy-fulfilling psychology that overwhelms competence and capacity. Yet, without some assessment, the process of development cannot be gauged and supported. When information about students' progress and achievements is framed and understood within the context of the students' own learning goals, it can be empowering for future growth.

The balancing, then, involves the creation of a developmental frame for evaluation and an evaluative frame for development. CPESS does the former by constructing the task of portfolio development as an iterative process (products can be worked on further if they are not ready for presentation or revised and strengthened thereafter) and by uncoupling the Senior Institute from the concept of age-grading. Students may complete the Senior Institute in one year, or two or three. Students who are not finished meeting graduation requirements may nonetheless go on to employment or take postsecondary coursework while they continue to work on their portfolios. Because the standards represent criteria all can ultimately reach, rather than norms and rankings that keep some continually "behind" or "below," they are motivating rather than discouraging as sources of information about competence.

Growth and development continue within the frame of evaluation. CPESS constructs an evaluative frame for development by using exhibitions throughout all the years of secondary school and by involving staff from all of the divisions in the development of graduation standards and the evaluation of portfolios. As a consequence, those who work with students throughout their years at CPESS carry with them an evaluative frame -- an understanding of goals, standards, and criteria -- that they can use in supporting their students' development.

Balancing Democracy and "Efficiency"

A key issue for all schools (and districts or states) involved in developing authentic assessments is the question of who should be involved in the process, how many, and with what degree of ongoing negotiation, rethinking, and, ultimately, voice. It may seem more efficient to have a few people create and implement an assessment than to have many insiders and outsiders continually involved in invention, negotiation, reinvention, and ongoing management of the assessment process. It may ultimately seem more efficient to have an external agency create and manage the process so that schools do not have to bother. State-developed tests, or maybe even a national examination board, could be viewed as taking the burden off schools for thinking about what should be assessed and how. Even within schools, there are decisions about the range of involvement and the extent of voice, in light of the need to get the job done. The temptation to take the most "efficient" route, however, undermines the possibilities for school, teacher, and community learning, ownership, and improvement.

CPESS has opted for a democratic process -- involving many members of the school community in developing the assessment system and supporting the students' work, and involving faculty from across the grades, students, parents, and people from outside the school in conducting the assessments. This democratization of the process has had important implications for integrating assessment into the life of the school and for creating, maintaining, and strengthening a collaborative culture with shared goals and values within a strong community. As in the assessment process, in the governance process, the whole is greater than the sum of the parts. Involvement creates learning and an internal engine for continual school improvement.

One of the many external review sessions used to evaluate the portfolio and the scoring process produced a clear example of how the public, collective nature of the process stimulates deep thinking about goals for learning and teaching. Early on in this process, a group of CPESS staff and local college professors met to score selected papers from some of the school's earliest portfolios. They compared their scores and comments to see if they were applying the same standards and to evaluate how the papers would stand up in a collegiate setting. While many of the papers received similar scores across raters, one did not. In a paper on ***Down These Mean Streets***, submitted for the literature requirement, the scores by 12 inside and outside evaluators ranged widely.

The ensuing discussion about the paper centered not only on standards for minimally passing papers but on fundamental issues in teaching and assessment: how to strike a balance between objectivity -- a focus on the product -- and subjectivity -- an understanding of the student; how to balance evaluative and developmental approaches to assessment; and how to balance the student's responsibility for his work and the school's responsibility to find ways to help him or her succeed.

The paper had a number of technical problems: The transitions were not clear, the

opening paragraph did not state the purpose, and the student failed to clearly present critical connections to other works. CPESS faculty member Jose Alfaro looked for its strengths: "I passed it for effort, voice, and struggle with issues. I passed it in the context of the portfolio. I didn't pass it in isolation." Haven Henderson also stressed the student's stretch in completing the work:

> I want to emphasize that we are going to keep running into the conflict between our standards and what we know about our students -- their histories, work habits, abilities. This student has a hard time getting things through. This paper is his first effort in completing a book and writing about it. His engagement level is very high because of the subject matter, although his writing needs more work. I graded this paper minimum pass because I have confidence in his ability to intellectually discuss the literary meaning of the book before his graduation committee and to make connections between his life, the life of his community, and the book. This is an opportunity for him to succeed. It would set the foundation for future improvement and success in the 13 portfolios to follow. Without this vote of confidence by the staff, his future remains jeopardized.

Jill Herman expressed the other point of view: "I didn't pass this paper. I gave it a 10. I felt the focus was missing." Pat Wagner asked a developmental question: "How many rewrites did the student do?" Jose responded that "he worked on this paper constantly. It was hard for him to go back and rewrite."

Deborah Meier voiced the broader school and teaching issue: "I think we're not really discussing if this paper meets our standards. It doesn't. I think we haven't figured out how to help him become a better writer. I think we're describing our dilemma as advisors. . . . I think we must evaluate this paper as if we were the outside world. Then we must focus on our role in helping him."

The list of observations and questions developed at the end of this session included these two, elaborating on the idea that the assessment process is focused as much on the school as on the student: "A review such as this one should make us more critical of ourselves than our students," and "How can we use this portfolio assessment to improve instruction?"

The answers to this question are as many and as varied as the occasions for instruction in the school. Every teacher we talked to at CPESS has found a stimulus to rethink curriculum and teaching, to reshape learning tasks and student supports, on the basis of insights from the portfolio process. And the collective nature of the assessment triggers a continual cross-classroom inquiry into ways of improving the webbing that supports students in the interdisciplinary and extracurricular niches that are equally important to their learning. As staff member Betsey McGee, who organized the assessment reviews, notes: "The minutes or summaries of the various assessment review meetings constitute a kind of running record of institutional self-study. These, along with many school events and needs, would

determine the staff development and school improvement focus." In the ongoing work of developing a school, the assessment process is providing an engine for continual examination and renewal.

The process of reflection also provides grist for continual changes in the assessment system. Each year as teachers have considered the kinds of performances the portfolio elicits and the information it portrays about students, they have made modifications. After the first year, many questions and suggestions came up as faculty surveyed the completed portfolios and evaluated what they could learn from them -- and what else they might like them to represent about students' abilities -- such as:

> We need videotapes of a student's graduation committee experiences to give the reviewers a fair picture of a student's portfolio.
>
> Most of this writing is narrative. I'd like to see the students write 500 word essays.
>
> The artifacts that are the underpinning of portfolio work have to be here, including attestations.
>
> We're uncertain about how much correcting we can do. Maybe we should see first and final drafts.
>
> I wanted to see some of her "scrappy" pieces -- what she worked on and struggled with.
>
> Maybe we should organize some on-the-spot exercises to see if students have organizational habits, to see how they go about thinking out a "problem."
>
> Does the portfolio show that the student has what she needs for college?
>
> In one class, we used the Vermont standards grid for gridding a paper. It was very successful. Would that grid be useful for evaluating this student's paper?
>
> Is there some way to make sure each student has a piece that shows what kind of student he or she is? It's related to the idea that every student present some sort of criteria of him/herself as a learner.
>
> I think we should look at the CPESS graduation requirements next meeting. Does the current ***Senior Institute Handbook*** really call for the kind of thinking we want?

In the seeds of these observations and questions lies the continual evolution of teaching, learning, and assessment within the Central Park East Secondary School community.

Because of CPESS's role in the Center for Collaborative Education -- a network of Coalition of Essential Schools schools in New York City -- and the New York State partnership program, the answers to these questions will inform the work of many others striving to work their way through similar issues in their own distinctive ways.

Standing Up in the Court of the World

The portfolio process, along with all of the other opportunities for authentic teaching, learning, and assessment at CPESS, influences student learning in a number of ways. First of all, by the students' own admission, they internalize the Habits of Mind and the habits of work required by the portfolio. As Paul Schwarz notes:

> Using the word "habit" was important. It's not enough to show that you can do something or that you know something. We say that you have to be in the habit of thinking that way. A major portfolio can't contain just one item. One piece of evidence can't demonstrate a "habit." Of course, having 14 portfolios means you have to show it 14 times in 14 different areas of work. That's even more evidence of a true habit.

As these several different testimonials suggest, the students see the value of what they have learned:

> We've been using [the Habits of Mind] for a while now. It just becomes natural, like a world view. You start to look at what evidence there is. You start to question everything. It all builds up.
>
> It affects your whole life, how you react to it. You start thinking in terms of a deeper level. Kids in this school think about topics like politics and race and other things that normally kids wouldn't think about. I mean, everyone's still interested in music and clothes and that kind of stuff, but there's also another part where kids are serious. They know the reality of the world.
>
> You're going to need it after you move on from high school and college and go into the real world. It's like a basic necessity -- like knowing how to brush your teeth. You're always going to have to write for whatever job you do. You want people to understand what you write. In a paper, you can't say, "Well, do you know what I'm saying?" You have to have the evidence and how it's connected to something else, where you got the evidence from.
>
> This is for us to know when we get out into the real world. . . . Habits of Mind stay in my mind whether inside of school or outside of school -- so we'll continue to use this.

Because the work is theirs, is continuous, and is authentic, students are motivated. "That's what leads to the responsibility of the students you'll find in this school," says John*, "where in every other high school in New York City, people skip classes every day, barely anybody at all skips school. The kids here just want to come to school -- or maybe they don't want to, but they do." The sense of responsibility for oneself and one's work wins out in the tug of war with competing adolescent priorities.

Second, students gain confidence that they can achieve in the world outside of school because they have already had the opportunity to do so. Among the most important things students learn from their opportunities to test themselves in authentic situations are the perseverance and the self-confidence that eventually come from determined effort. Having been given the chance to engage in work on the world's terms through internships and college courses makes it easier to go out into the world with the expectations -- matched with skills -- for success.

There is outside validation for the views of students that they are prepared for what lies ahead. Joe Walters notes that colleges are increasingly willing, and sometimes pleased, to review the students' nontraditional CPESS transcript and even portfolios. They are frequently impressed by what they see and even more impressed when they meet CPESS students, particularly "with the students' ability to speak and communicate in general, with the kinds of questions they ask, and the kinds of things they want to know about colleges. They see them as being much more prepared in that process than students from traditional high schools."

A recent report from the "SUNY 2000" task force of the State University of New York suggests that this acceptance of new modes of assessment is becoming more widespread. The report on college-level knowledge and skills explicitly encouraged performance-based assessment through portfolios, projects, and exhibitions as a tool for college admissions, freshman year counseling, and documentation of ongoing development throughout college. The task force urged that students engage in "a continuous authentic assessment experience thoughout their high school years (and) create an assessment file that could be taken with them to college and used there for academic planning and advisement" (State University of New York, 1993, pp. xii-xiii). An increasing number of these campuses are engaging portfolio development and use with local high schools.

These encouraging developments were an unknown when CPESS launched its initial efforts, creating a great deal of uncertainty among the parents of the first graduates. As Darwin Davis recalls:

> The portfolio as assessment was a grand experiment. There was a point in time where the collective parent body hit the collective panic button. And that was at the time when their children were entering the eleventh grade and were about to undergo that process known as applying to college. So PSATs, SATs, the variety of prep courses, the requirements by recruiters, and

> therefore, schools, as to what students are supposed to display in order for them to enter colleges of their choice became very important. Parents were now having to confront their ideals with what I would call the political reality of entering the college of their choice. And the ideal was that "yes our students are these well-rounded, gifted individuals with multitalents displayed in these 14 portfolio items"; the reality was that schools were asking for grade average, class rank, SAT score.
>
> That was a scary time for parents. It was a time in which we were tested. And several were ready to abandon the ideal for the so-called real. There were a small group of parents, and Haven [Henderson] in particular, who did a terrific job at convincing parents that if this school was going to succeed they had to stick by their guns. They had to stick by the 14 portfolio items. And perhaps in the first year every school would not be willing to change their guidelines to accept some of our students. But some would, and we needed to work with those that would. And when it was all said and done, there were several schools, I remember Syracuse being one in particular who was quite reluctant to do anything out of the ordinary, but in the end they did. They accepted something that was very different from what they were used to from CPESS, and I think that's paved the way for other colleges to broaden their own horizon and look at how do those class rankings actually lead to the kind of productive student that they say they want, but they've set up a different system for screening.

The evidence is that the CPESS system does lead to the kind of productive students colleges say they want. One recent graduate, now at Cornell, wrote in a letter to one of her teachers, "Those five CPESS 'Habits of Mind' are proving very useful here." Another graduate wrote: "They set us aside as special." People are "impressed," noted a third on his visit back to the school after graduation (Meier, 1992, p. 217).

Other outside assessments of students' work confirm this view of their readiness. In the course of a variety of exercises used to review and validate the portfolio assessments, CPESS invited university faculty to rate a range of papers. With respect to the humanities portfolios, professors from local colleges were asked whether the papers as a group were comparable to freshmen papers and how they would be received as term papers. Even as the professors acknowledged the technical and structural problems exhibited by some of the papers, their responses were positive about the comparability of CPESS students and freshmen entering city colleges. Bill Bernhardt of the College of Staten Island responded: "My first impression was that most of these students would have passed the CUNY [City University of New York] writing assessment and been placed in regular composition classes. . . . It's refreshing to see the type of work these students are doing. The topics and books tackled here are pertinent to their lives and far more meaningful than usual." His colleague, Peter Miller, commented: "I was struck that the problems are very much the problems of freshmen students in college. We are in the same area. . . . There are a lot of students who

come into our college's English Department unable to do what these CPESS students are attempting to do." Nancy Barnes, from Lang College, agreed, noting that "these are the same problems we see in a moderately selective college."

A meeting of college and school faculty for a math/science portfolio review produced similar assessments. Gary Benenson, a professor at CUNY's Engineering School, noted that "this school has been successful in showing kids that knowledge is constructed. How do you do this?" Dave Feldman responded, "We throw back questions to the students. The teachers are only facilitators."

As facilitators, teachers help students take responsibility for becoming competent, resourceful learners, rather than dishing out answers in ways that maintain the teacher as powerful and the student as passive. The portfolio process supports this role. Regardless of the kind of life's work students decide they want to do, they are better able to organize themselves to do what is needed to get started and to succeed.

As it turns out, and totally against the conventional odds of secondary schooling in New York City, 96 percent of CPESS's first class of graduates in 1991 were accepted to college. Ninety-two percent were admitted to four-year colleges. The other two students from this class of 50 also achieved their goals: One was accepted by the Police Academy, and the other entered a computer training program. This is especially noteworthy in a big city school system that typically graduates only 60 percent of those who enter high school and sends only a small fraction on to postsecondary education or training.

CPESS provides a broader view of academic and vocational education than most schools that focus on one in isolation from the other. Unlike most students going off to college, these graduates have had a chance to develop their interests and talents -- to apply them in real-world situations, to find out what they like to do and what they want to apply themselves to do. This is the first step toward a satisfying vocation and a satisfying intellectual life. A second important step is knowing that CPESS can generate and meet its own standards for success while also meeting students' needs. Darwin Davis attributes the school's success to its willingness to take students on their own terms, find their strengths, and develop their talents:

> There should be more schools like CPESS, what I would call a child-centered school, where education needs are taken into account, the developmental stages of children and the variety of developmental stages -- schools that accommodate that difference in a way that promotes educational goals and the development of that human being vs. pigeonholing that individual on the basis of rote seatwork. We need more schools that can take into account the development, the habits, the proclivities of children rather than trying to force children to adapt to the habits and proclivities of institutions that pretty much everybody believes aren't working. Even our best and brightest aren't competing in the world arena. CPESS students can compete in the world

arena. We need more schools like CPESS.

As one of the first graduates, Steve* concurs that the CPESS approach has allowed him to develop his own evidence that he can and will succeed: "This environment gives us more standards. It makes us stand up straight. . . . It makes us look at ourselves in the mirror and feel proud of our accomplishments." His experience has given him a sense of self, an entitlement to be somebody, in contrast with the kids he describes feeling sorry for in his neighborhood, "who hang around wasting their lives." And he, like his classmates, has his work, tested against his own and the community's standards, to testify to the fact that his accomplishments are real and will stand up in the "Court of the World."

References

Center for Collaborative Education (n.d.). ***Essential Principles***. New York: Center for Collaborative Education.

Central Park East Secondary School. (1991, October 7). Newsletter #5.

Central Park East Secondary School (n.d.). ***A Public High School: Central Park East Secondary School***. New York: CPESS.

Central Park East Secondary School (1990). ***Senior Institute Handbook***. New York: CPESS.

Central Park East Secondary School (1991). ***Senior Institute Handbook***. New York: CPESS.

Fowler, W.J. (1992). "What Do We Know about School Size? What Should We Know?" Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA.

Gottfredson, G.D., and Daiger, D.C. (1979). ***Disruption in 600 Schools***. Baltimore, MD: The Johns Hopkins University, Center for Social Organization of Schools.

Green, G., and Stevens, W. (1988). "What Research Says about Small Schools." ***Rural Educators***, ***10***(1): 9-14.

Haller, E.J. (1992). "Small Schools and Higher Order Thinking Skills." Paper presented at the Annual Meeting of the American Educational Research Association. San Francisco, CA.

Howley, C.B. (1989). "Synthesis of the Effects of School and District Size: What Research Says about Achievement in Small Schools and School Districts." ***Journal of Rural and Small Schools***, ***4***(1): 2-12.

Howley, C.B., and Huang, G. (1991). "Extracurricular Participation and Achievement: School Size as Possible Mediator of SES Influence Among Individual Students." ***Resources in Education***, January 1991.

McDonald, J. (1993). "Planning Backwards from Exhibitions." In ***Graduation by Exhibition: Assessing Genuine Achievement***, pp. 1-13. Alexandria, VA: Association for Supervision and Curriculum Development.

Meier, D. (1989, September 8). "In Education, Small is Sensible." ***The New York Times***, p. 25.

Meier, D. (1992, Spring). "School Days: A Journal." ***Dissent***, pp. 213-220.

Shepard, L. (1993). "Evaluating Test Validity." In L. Darling-Hammond (Ed.), ***Review of Research in Education, Volume 19***. Washington, DC: American Educational Research Association.

State University of New York (1993). ***College Expectations: The Report of the SUNY Task Force on College Entry-Level Knowledge and Skills***. Albany: SUNY.

Appendix 1

CENTRAL PARK EAST SECONDARY SCHOOL
1573 Madison Avenue, New York, NY 10029 Tel: 212 - 860 - 8935

Deborah Meier,
Co-Director

Paul Schwarz
Co-Director

CENTRAL PARK EAST SECONDARY SCHOOL
PORTFOLIO ABSTRACT

Student Name *Keisha**

Advisor Name _____

Date Submitted *3/12/93*

Title of Project *2 Experiments: a comparison of hair straightners & hair removers; a comparison of infrared rays & microwaves*

Portfolio Category *Science*

Abstract: Write four to five sentences describing your portfolio item, including your purpose, main ideas, and themes.

My Science portfolio consists of two different parts; the first being an investigation of the effects of hair products on the scalp and hair, the second being a comparison of microwaves and infrared rays and the effect they have on eatable objects.

Be sure your portfolio item is complete. Include: organizations contacted, people interviewed, written materials, references, appendix, bibliography, audio-tape, video-tape, summary of presentation/demonstration etc.

Science is a method of research in which a problem is identified, a hypothesis is formed and tested. Science is also the study of and knowledge of the physical and material world.

Physical science is the area in which I have focused my attention during my last couple of semesters at CPESS. The two labs I used for my portfolio deal with the physical aspects of science. The physical aspects are physics, chemistry and anatomy.

Material science is the study of a substance or substances of which an object is made or composed. One could say the difference between the physical and material studies is that in one, researching an existing object naturally formed is done while in the other, researching man-made items and substances is involved.

Researching the object is done through science application. An example of this would be the explosion at the World Trade Center. Science was applied during the investigation of what caused such a large and deadly explosion. The FBI found traces of nitrate near the area of the explosion; this led them to believe that the bomb was made of fuel and fertilizer. They pursued that theory and tested it.

The whole World Trade Center ordeal made it clear to me that both physical and material science work together. My two labs addressed the combination of the two studies, but I was researching another aspect.

For my first lab I went into the chemical formation of household products. I first studied the 103 elements of chemistry. Elements are substances that can't be broken down any further then they already are. When they are combined they form new products called compounds. These compounds are then placed in household products, food, etc.

I came up with a lab that could test the compounds in hair products and how they effect the scalp and hair. This was of interest to me because I often use the hair products tested in my lab.

For my second lab I investigated how we find physics in almost about anything we see and touch. I focused on the radiation aspect of physics; to be more specific, the effects of microwaves and infrared rays on eatable objects. This was of interest to me because I often use my microwave to warm up food and I wanted to know if there was a drastic difference between warming food in a microwave oven or warming in a conventional one.

Abstract

When you enter a beauty supply store do you look at what the substance contains? Well after reading this lab you might think twice about what you say helps your appearance. I was once naive to what type of chemicals manufacturers placed inside hair remover and relaxer products. And the chemicals to which I knew the products contained, I didn't believe had such a negative affect on the chemical make up of hair and skin.

Be prepared for what you are about to witness, because it might have a powerful affect on what you do to make yourself look beautiful.

Introduction

My lab deals with the chemical properties of relaxer and hair remover and how it effects the chemical properties and physical properties of hair and skin.

Hair and skin are made up of numerous cells, the cell that over shadows all other cells is keratin. Keratin is made up of two cross-link bonds, disulfide and hydrogen. A break down of these bonds can cause a difference in the physical characteristics and chemical reaction.

Relaxer and hair remover are two substances that can breakdown the disulfide and the hydrogen bonds. Substances that can cause a break down are called kerantinase. It dissolves the protein in the hair shaft, turning it into a gelatinous mass that can be wiped away, this is what happens when hair remover is applied. Being that the substance doesn't affect the hair root, regrowth of hair occurs.

When relaxer is applied to the hair on top of a persons hairs, it too, dissolves the hair. But before the relaxer causes the hair to fall out, he/she is to rinse the relaxer out. When a perm is not applied properly the loss of hair will sometimes occur.

Since relaxer and hair remover have similar ingredients, in their chemical make up, similar reactions will occur (like hair loss). The relaxer used for this experiment doesn't have lye in it but it does contain hydroxide (as does the hair remover). Hydroxide, no matter what it's mixed with, will have a high base content. As a result when either hair remover or relaxer is placed on or near the skin, skin irritation and extensive burning may result.

When people came up with the "conk", numerous people experienced hair loss, and skin irritations. This was due to the high level of base contained in lye. As a result of the injuries, manufacturers added other ingredients that would neutralize the Ph in relaxers. If I were to compare the most recent relaxer to the "conk", I'm sure there would be a drastic difference in the level of bascity or alkalinity in the substance.

My experiment consists of taking two substances that are used for different purposes, (but similar ingredients) and comparing how they affect the make up of hair and skin. I will then test and compare the pH levels of both substances.

Focus Question

How do the active ingredients in hair remover and relaxer compare when applied to hair and skin? How do they compare when tested for pH level?

+Instead of using actual skin for this experiment, slices of ham will be used in its place.

Materials

~Revelon Relaxer w/o lye
active ingredients:
* water
* mineral oil
* calcium hydroxide
* cetearyl alcohol & ceteareth-20
* propylene glycol
* PPG-12 PEG-65 lanolin oil
* cetyl alcohol
* dea-lauryl sulfate & sodium laurominopropionate & dea-laurominopropionate

~Nair lotion hair remover
active ingredients:
* water
* mineral oil
* calcium hydroxide
* sodium thioglycolate
* cetearyl alcohol
* calcium thioglycolate
* ceteareth-20
* cocoa butter
* fragrance
* tocopherol (vitamin E)
* D & C yellow #8

~Human Hair
active ingredients:
* keratin

~Comb **~Rubber Gloves** **~Ham**

~Mannequin **~Microscope** **~pH Paper**

Procedure

step #1 - rinse hair with hot water
#2 - blow dry hair, till no longer damp
#3 - cut hair into 4 pieces, label the pieces A, B, C, and D (consecutively)
#4 - place hair pieces on mannequin, and put on rubber gloves
#5 - take one strand of hair from each hair piece
#6 - look at hair strands under microscope (record observations)
#7 - apply Revelon relaxer to hair pieces A and B
#8 - comb relaxer through hair till all of the hair is covered

Procedure (con't)

step #9 - apply Nair hair remover to pieces C and D
#10 - comb hair remover through hair till all of the hair is covered
#11 - record observations
#12 - after 15 minutes, rinse out hair pieces A and C (let pieces B and D sit for another 15 minutes)
#13 - blow dry hair till it is no longer damp
#14 - record observations (for all 4 hair pieces)
#15 - take strand of hair from pieces A and C
#16 - place the hair under the microscope and record all observations
#17 - repeat steps #12 - #16 using hair pieces B and D (opposed to using A and C)
#18 - record all similarities and differences between hair pieces A, B, C, and D
#19 - place a piece of ham under the microscope and record observations
#20 - label two pieces of ham X and Y
#21 - apply a sample of relaxer on piece X
#22 - record observations
#23 - rinse substance off of piece X
#24 - place piece X under microscope and record observations
#25 - repeat steps #21 - #24 using piece Y and hair remover
#26 - take three pieces of pH paper and place them on a clean surface
#27 - label the pieces of paper M, N and O
#28 - place a sample of relaxer on piece M
#29 - place a sample of hair remover on piece N
#30 - place a sample of hydroxide on piece O
#31 - record observations
#32 - take off the rubber gloves and dispose of them in the garbage

Results and Observations

Piece	Color Change	Coarse/ Straight	Stable/ Removed	pH level
A	N	C	S	10
B	N	S	S	10
C	N	S	S	11
D	N	c	R	11
X	N	-	R	10
Y	N	-	R	11

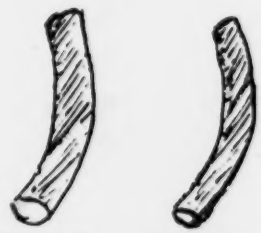


fig. 1 fig. 2
Relaxer

fig. 1 fig. 2
Hair Remover

1) What kind of texture was hair/skin originally?

The hair, was coarse and very wire like (I used dreadlocks) while the ham, was moist with small pores.

2) Did the texture change after substance was applied?

A no there was no change in texture
B yes there was a change, the texture was thinner
C yes there was a change, the texture was rough and the hair was beginning to split
D yes there was a change, the texture was rough and was breaking apart
X a slight change occurred, the ham began to peel
Y yes there was a change, the ham began to fall apart

3) How did the two substances differ?

The hair remover was a yellow lotion with a strong odor before and after it was applied, while the relaxer was a white cream like substance that smelled after it was applied.

4) How did the two substances compare?

Both the hair remover and relaxer had a reasonably high pH level and both were easy to apply to hair and the ham.

5) What did you see under the microscope prior to applying the substance?

The hair was coarse and looked like wire when placed under the microscope. The hair was also a deep black. The ham resembled skin under the microscope because it had pores similar to that of human skin. The ham was also a dull pink.

6) What did you see after you applied the substance?

There were certain parts of the hair where it looked as if it fell apart, and other spots where you could tell the fiber of the hair was splitting. The ham stayed the same color but you could see that it lost some of it's moisture, and the pores were slightly bigger than before.

7) Do the relaxer and hair remover have the same affect on hair?

No, the hair remover had a stronger affect on the hair. It caused it to split after being applied after only, 15 minutes. I believe this was a result of it having a stronger pH level.

8) Do the relaxer and hair remover have the same affect on skin (ham)?

Yes, both substances caused the ham to loose moisture and peel. The only difference was to what extent the ham peeled. Once again the hair remover demonstrated its strength over relaxer.

9) What happened after the extra 15 minutes (pieces B and D)? Why?

Piece B, was of a thinner texture than piece A. This was a result of the relaxer needing time to take affect, but piece D wasn't as stable as piece C. When touched the hair broke causing a split of the fiber. This is an example of what can happen when hair remover is left on for a long period of time.

10) Did a break down of the disulfide or hydrogen bonds occur? If yes, what happened?

The break down occurred when the hair lost its strength, and when the ham lost its form and moisture. I believe the two bonds in fact have a lot to do with the object staying in tact, and after this experiment its easy to see that this wasn't the case.

11) Is there a drastic difference in the alkalinity of the relaxer, hair remover and sodium hydroxide? If yes, why?

Hair remover - 11 Relaxer - 10 NaOH - 11

The substances contain hydroxide. Hydroxide has a very high pH level, and to neutralize it would take numerous chemicals that have a very low pH level. Even then the pH level of hair remover and relaxer might not decrease.

Conclusion

The idea of both substances sharing numerous chemicals is a scary one. Since relaxer is used to make one's hair more manageable... but just think about it, relaxer is strong enough to remove hair from the scalp, and expand ones pores.

Before I actually tried the experiment I thought the mineral oil and water would somehow neutralize the substance but I've come to realize that both are probably used to soothe the scalp after such a harsh substance. My original idea is kind of a silly one because as a scientist I should have known that hydroxide is a powerful substance no matter what it is combined with.

Knowing what relaxer can do to the hair and skin, can turn one away from applying it to one's scalp. It's no wonder more African-American women are allowing their hair to grow naturally, and are using more natural herbs and oils for their hair. After repeatedly applying powerful substances the breakdown of the disulfide and hydrogen bonds is obvious to a beautician, but not the ordinary person who looks at the hair.

Overall, we as consumers need to pay closer attention to the chemical make-up of the products we purchase, because one would never think that the hair remover and relaxer contain the same chemicals.

Bibliography

~Tortora, Gerard J. and Anagnostabos, Nicholas P.
Principles of Anatomy and Physiology: sixth edition
New York
Harper & Row Publishers
@1989

~Oelerich, Randall
Case Studies in Anatomy and Physiology
Missouri
Mosby-Year Book Inc.
@1992

~Hair
Colliers-Encyclopedia
MacMillan Educational Co.
@1990
Volume 11, pp. 579 - 580

~"Black Like...Shirley Temple"
Harpers
February 1992
pp. 102 - 105

~"Hair Problems Solved"
Essence
January 1993 (Volume 23, #9)
pp. 8 - 10

~"Hair Trend Watch"
Essence
January 1993 (Volume 23, #9)
pp. 20

~Keratin
The Merck Index: an Encyclopedia of Chemicals and Drugs
Merck and Company, Inc.
@1976
pp. 694

~Kerantinase
The Merck Index: an Encyclopedia of Chemicals and Drugs
Merck and Company, Inc.
@1976
pp. 694

Abstract

Can a microwave and infrared rays cook an object to the same degree? It has been said that a microwave takes less time than a conventional oven to prepare a meal. This will be tested by the use of a hot dog and a slice of bread. When you read up on electromagnetic waves you find that microwaves can penetrate through most objects while infrared rays cannot. The power of both electromagnetic waves will be demonstrated and discussed within this lab.

Introduction

Can a microwave and infrared rays cook an object to the same degree? Maybe. To answer this question there are two methods. The first is to research and compare the numbers. The second way would be to actually try the experiment and see if there is in fact a difference. Well I tried both methods.

While I was reading up on microwaves I used my microwave to warm up something to snack on. When I bit into the pastry, I realized that the inside was slightly hotter then the outside. Another thing I noticed, was the pastry didn't turn brown at all on the outside. This was because a microwave oven cooks an object from the inside, out.

The molecules inside the pastry rub against each other as they speed up, causing friction, and friction causes heat. Since the microwaves cook the inside of the pastry first, the pastry will be cooked inside out and this prohibits the pastry from turning brown.

If I had used a conventional oven (infrared rays) the outcome would have been different. Infrared (heat waves) also go through an object. The hotter the heat source, the hotter the heat waves will be. These heat waves will hit the outside of the pastry, causing the pastry to turn brown. As the waves continue to hit the outside they start to progress towards the center of the pastry. This demonstrates that the heat waves are cooking the pastry outside, in.

There are some similarities between both the microwaves and infrared rays. For example, like other electromagnetic waves and rays, they are not visible to the human eye, and both take some form of radiation.

Infrared rays are rays that often come from a hot object, like a light bulb. The rays move through space, the same way water waves travel in a pond. When the wave/ray hits an object the atoms and molecules speed up and cause friction. Microwaves move in a similar motion. What makes microwaves different from infrared rays is the frequency at which it moves.

A conclusion that is obvious is the fact that both cause molecules to move faster, causing friction (which causes heat). Instead of testing this hypothesis with a pastry I am going to use a solid object (a hot dog) and a loosely baked object (bread), to see if density plays a role in the affect that radiation has on an object. The molecules in the hot dog are more compact and out number those of bread, so the amount of time in which it should take the hot dog to cook might be slightly shorter than the time in which it takes the bread. My experiment will focus on the differences and similarities of both objects when cooked by different forms of radiation.

Focus Question

Can infrared rays and microwaves cook an object to the same degree?

Materials

- microwave oven
- 150 watt bulb (or a conventional oven)
- foil paper (or concave metal plate/dish)
- hot dog(s)
- bread (a couple of slices)
- time clock
- thermometer

Procedure

Step #1
- take the metal plate/dish or foil

Step #2
- place the light source (150 watts) in front of the dish with the focusing on the dish

Step #3
- place the hot dog in what is the focus point of the concave dish

Step #4
- place another hot dog inside the microwave oven

Step #5
- set the timer on the microwave oven on 3 minutes

Step #6
- set the time clock on zero

Step #7
- take the thermometer and take the starting temperature for both hot dogs

Step #8
- record the temperature on a table and label this, starting temperature microwave, and infrared rays
- turn the light source on and start the time clock (simultaneously)

Step #9
- start the microwave

Step #10
- at the first minute that passes stop both and take the temperature of both hot dogs

Step #11
- record the temperature on the table as 1 minute

Step #12
- restart the microwave and turn the light source back on, at this point you want to restart the time clock

Step #13
- do the last three procedures for 2 minutes, 3 minutes, etc...

Step #14

- after you have measured and recorded the temperature for the remaining times, answer the results and observation: questions and any additional observations made

Step #15

- do the same procedure (above) only this time using bread opposed to hot dogs

Results and Observations: questions

- Look at the results. Is there a difference between the starting and final temperature? (Referring to the hot dogs and bread separately)

- Which object had a greater difference between the starting temperature and final temperature?

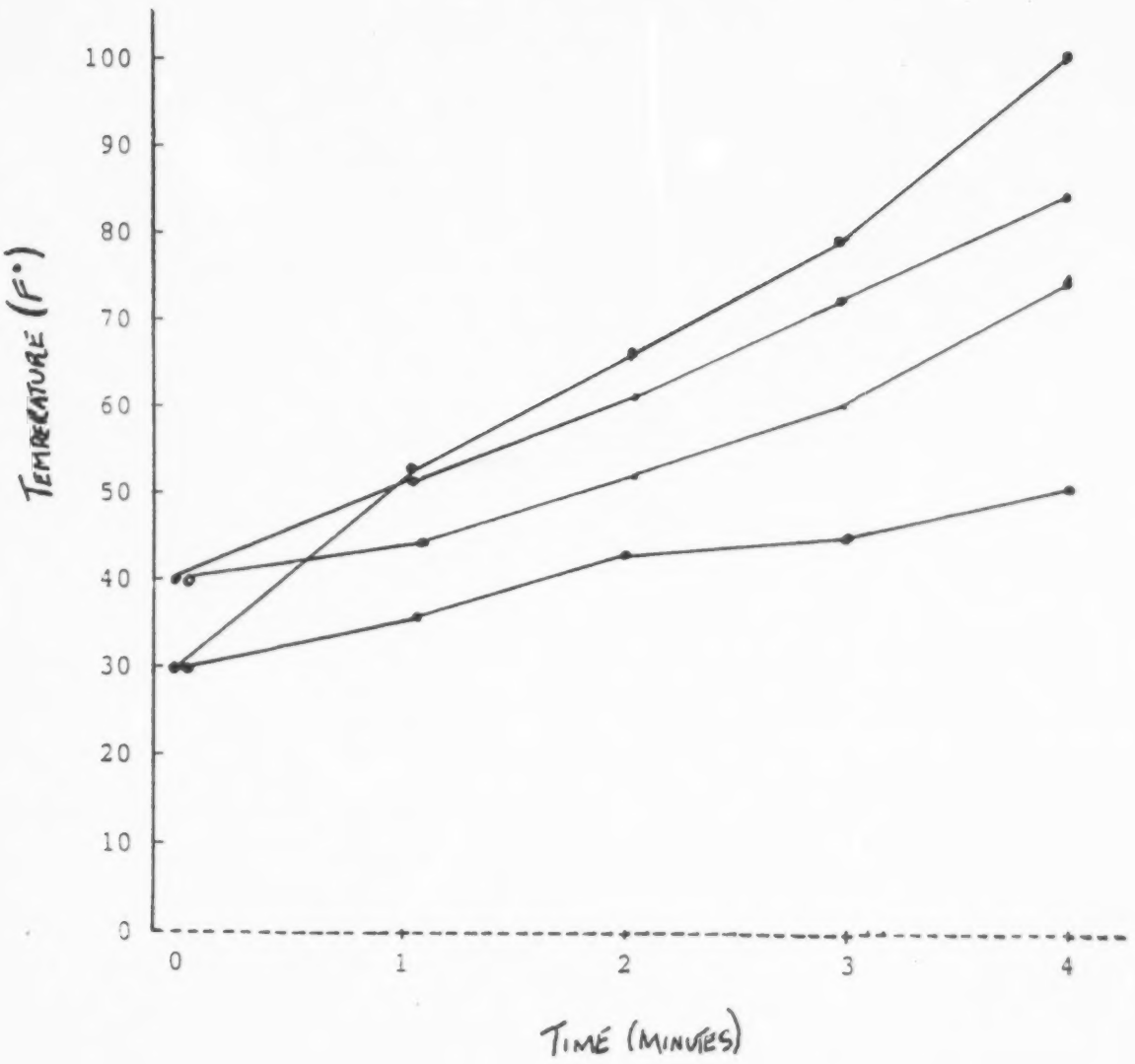
- Is the temperature of the object greater when using the microwave or the heating source (infrared rays)? Is the difference drastic or minor?

- Why is there a difference between the microwave and infrared ray temperatures?

- Is there a difference in the way the outside looks? Why?

Tables and Graphs

	HOT DOGS		BREAD	
	Microwave	Infrared	Microwave	Infrared
starting -	30	30	40	40
1 minute -	55	36	53	43
2 minutes -	68	44	60	51
3 minutes -	80	46	71	60
final / 4 minutes -	101	51	82	73



Results and Observations: answers

- Yes, there is a difference between the starting and final temperature. This is a result of the object being affected by the radiation.

- The hot dog had a greater temperature, because 1) there is more moisture in the hot dog then the slice of bread, 2) the molecules of the hot dog are more compact then that of the bread, and 3) the outside acts as skin and holds all heat that is produced by the radiowaves.

- Microwaves focus on the inside of the object, while infrared rays focus more on the outside of the object and progress' inward to center. Being that when the thermometer is placed in the center when taking the temperature, which ever radiowave makes the center hotter will be thought of as the one that causes more heat.

- The outside of the hot dog and bread that were cooked by infrared rays were slightly darker/browner than those cooked by the microwaves. This is a result of the infrared rays always being in contact with the outside while trying to warm up the inside. This is what causes food to burn when being cooked in a conventional oven.

Conclusion

Well, I think I have proved both in written form and physical form that microwaves do in fact cook a hot dog to higher degree than infrared rays. The focus question asked if they cook to the same degree and we answered that... but at the same time the difference isn't drastic in fact it is actually kin of close (referring to the temperature/degree). What is different is the outside appearance of the object. When cooked one way you are under the impression that it is cooked when the object turns brown, and when cooked the other way it's cooked but you are under the impression that it isn't because it's not brown.

I believe that if I were to do the experiment again the initial temperatures would vary somewhat being that I could have made human errors like reading the thermometer wrong or inserted the thermometer the wrong way.

It wouldn't be a drastic difference because there isn't that much of a difference in the frequency level of microwaves and infrared rays (look at electromagnetic spectrum).

So to answer the focus question, one could say that microwaves and infrared rays do cook objects to different degrees. The difference isn't drastic but there is in fact a difference, both in the way the food is cooked and the way it looks. If you are inviting guests over and want the food to look good, be prepared to lt it cook for a while, because you will have to use a conventional oven. It is necessary that the food be in the oven for a long period, this is done to ensure that the food is cooked properly. If you are just making something to eat for yourself and don't care how it looks, using the microwave would be an ideal thing to do, since it is not time consuming.

Bibliography

~Infrared Rays
The Merck Index: an Encyclopedia of Chemicals and Drugs
Merck and Company, Inc.
@1976
pp. 680

~Microwaves
The Merck Index: an Encyclopedia of Chemicals and Drugs
Merck and Company, Inc.
@1976
pp. 710

~Infrared
Colliers-Encyclopedia
MacMillan Educational Co.
@1990
Volume 11, pp. 640 - 641

~Freeman, Ira M.
Light and Radiation
Random House
New York
@1968

~White, Jack R.
The Invisible World of the Infrared
Dodd, Mead & Company
New York
@1964

~Asimov, Isaac
Understanding Physics: The Electron, Proton, and Neutron
New American Library
New York
@1966